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OF THE

ASIATIC SOCIETY OF BENGAL,

EDITED BY

THE SECRETARIES.

VOL. XXXII.

Nos. I. to IV., and a Supplementary No.—1863.

“It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish if such communications shall be long intermitted: and it will die away, if they shall entirely cease.”

SIR WM. JONES.

CALCUTTA :

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1864.

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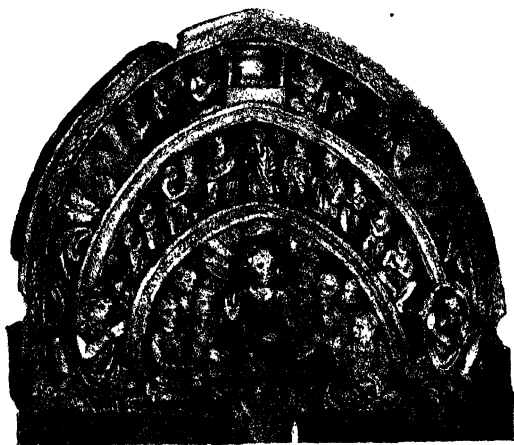
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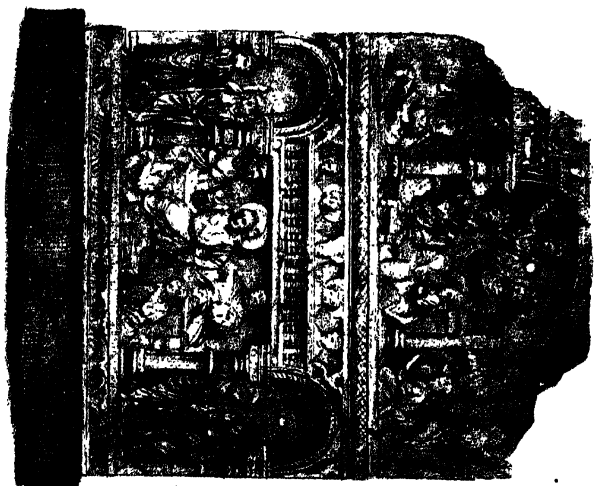


N°6

J. L. Frazer Ltd.

SCULPTURES FROM NAOGRAM.

(illustrate the Rev. A. J. Lowenthal's paper)



JOURNAL

OF THE

ASIATIC SOCIETY.

No. I. 1863.

*On the Antiquities of the Peshawur District.—By the Rev. I.
LOEWENTHAL.*

Saint-Martin, in his *Mémoire Analytique sur la Carte de l'Asie*, in endeavouring to identify Hiouen-Tsang's Ou-to-kia-han-t'cha, not with Atok, but with Húnd, mistaking the pronunciation of the latter name, complains in reference to Yusufzai and the region about Peshawur that *Malheureusement nous sommes ici sur un terrain dont l'exploration archéologique est à peine entamée*. And it is too true. Whilst the Mahomedans of Northern Africa and of Western Asia not only do not prevent the enterprising Englishman from digging up their graves, but lend even a helping hand in the work, the most interesting localities in the immediate neighbourhood of British territory are utterly forbidden ground to any adventurous archeologist, on account of the unmanageable nature of the independent frontier tribes. And yet, few regions, out of the realm of soil made memorable by either classical or religious associations, would yield a richer harvest of the materials with which to eke out the records of history, than the plains and the hills now almost or altogether within sight of British cantonments. Few even of the scores of mounds* which cover the plain of Yusufzai, have as yet been in any

* Since writing the above I have received an interesting communication from Major Burroughs, H. M. 93rd Highlanders, in reference to the mounds which are such a feature of the Yusufzai plain,—an extract from which may perhaps not be unacceptable. In speaking of the Broughs or Paecht's Houses in Orkney, he says:

“These ‘Broughs’ are to all outward appearance mere mounds of earth like the tumuli scattered over the plains of the Panjab and throughout the valley of Peshawur, excepting that in the valley of Peshawur they appear always to be

way investigated, much less opened; and still fewer have been the attempts to search the hills which abut on this plain, although every attempt in this direction has been abundantly rewarded. Some of these latter, indeed, require description even more than search, as the remains of buildings on them alone are most remarkable. A late visit to three of these localities, induces me to say a few words, by no means by way of description in the least degree exhaustive, but rather by way of direction for any one with more leisure, and with more previous acquaintance with Indian, Buddhist, and Bactrian antiquities, than I have, to do these interesting subjects justice.

The hill of Takhti Bai, or *Bahai*, as it is called by the natives, has been frequently mentioned, and must have been described before this. It is an isolated, barren hill of no great height, about eight miles west of Fort Hoti Mardán in Yusufzai. It forms, irregularly, three sides of a square, with the open side towards the North-west. The inner slopes of this hill are covered with the still standing shells of lofty buildings, constructed of hewn stones; most of them are of at least two stories, the openings for the beams of the upper floor

covered with bits of broken pottery, which I have not noticed elsewhere." [This opinion that *all* the mounds are covered with broken pottery, though very general, is not correct: many are.] "I have come across these same tumuli in the Orkney Islands (in the north of Scotland), about Stonehenge on Salisbury Plain in England, on and about the battle-field of the Alma, on the Plateau of Sebastopol and about Kertch and Yenikale in the Crimea; and here again on the plains of the Punjab and in the valley of Peshawur. To all outward appearance, they are alike. On the Plateau north of the Alma, these tumuli were generally in great circles with intervals between each tumulus of about half a mile. At nearly every point along the ridge of the Plateau of Sebastopol overlooking the Tchernaya, where the French, Turks and British had thrown up batteries, was a tumulus to be found. The white telegraph tower on the battle field of the Alma, captured by the Zouaves was built on an old tumulus. The tumuli on the plain between Peshawur and Hoti Mardán are also dotted in circles. At Stennis in Orkney and at Stonehenge in England a druidical circle of standing stones is to be seen in the centre of the great circle of tumuli." [There is such a circle of standing stones also at Shewa in Yusufzai, to which the people there attach very superstitious notions. The Khan of the place told me that he had frequently placed men to count the stones, but the stones kept increasing and decreasing in number the whole time that they were being counted, and the same number would not come out twice. There is a single stone of the same nature, with a broken one at a little distance from it, some miles to the south of Shewa, in the midst of the Mera (or desert) near a mound.] "I was at the opening of a tumulus, on my own property in the Island of Ronsay in Orkney, which was in shape like a bee-hive under ground. A large stone covered the opening and over the stone was some two or three feet of earth. It was about twelve feet high from the floor inside to the aperture. There was an aperture below leading to some underground passages. It was close to the seashore and was called by the people a 'Paecht's House.'"

and the windows remaining to attest the fact. They were constructed with much care, the walls being smooth and straight, showing signs also of having been stuccoed or at least plastered. The buildings are of various sizes; the steps leading to the upper story being either outside the building, or attached inside closely to the outer wall, the vacant space under the staircase being generally fitted up as a cell. The stone of which these buildings were constructed is found on the spot; the blocks are well hewn and carefully fitted. The centre of all these structures is formed by a quadrangle consisting of cells closely resembling in structure the altar in figure No. 10; that is, they consist of a square base, open in front, of little more than a man's height; this surmounted by a coping, which in shape is the lower part of a paraboloidal vault; and a short cylinder connects this coping with a hemispherical cupola which is open at the top. (Single cells, or perhaps altars, of this kind, though much larger in size, are found in various spots all over the hill.) One side of the quadrangle has an opening as a doorway to which steps led from an enclosure round the quadrangle. Its centre is occupied by the ruins of a raised platform, whose sides were adorned with figures in stucco or stone. Close to this quadrangle there is what may readily be considered a vaulted subterranean passage, though from the fact that the debris everywhere conceal the original level, there is great uncertainty as to its real depth below the original level of the ground. It may have been a bauli. There is no water on the hill now any where; the Pushto word *Bahai* means a bauli; yet there is a possibility that *Bahai*, the name of this hill, may be connected with the old *Vihara*.

Another most interesting hill showing many remains of Buddhist times, which I ascended, is on the Buner frontier, the nearest British village being that of Bábúzai. It is very much higher than the hill of Bahai. The ascent from the East, from the Sudum valley, is said to be easy and readily performed by mules; that from the other side I must call toilsome and steep, for the most part, differing in this respect very much from the ascent of Bahai, which is easy, along a well-trodden path which exhibits in several places very distinct traces of steps cut in the rock, for great distances. A portion of the way up, however, led along the channel of a mountain stream, then dry (April 25th,) whose banks—if banks can be spoken of where rocks

and large boulders conceal both the banks and the torrent's bed—were covered with an impermeable thicket of a magnificent flora; trees blazing with an indescribable profusion of gorgeous blossoms; shrubbery bending under the weight of fragrant flowers of the most pleasing colours; palm trees waving over head; with sequestered cave-like nooks, partly artificial, constructed over cool springs, traces of terraces, remains of tanks and water-courses,—all spoke of men of taste as well as enterprise, who had chosen and beautified this spot as their abode. There are a few caves scattered over the side of the mountain, but the most remarkable of all is a large cave near the summit, which was pointed out by General Court, many years ago, in the eighth volume of the Journal, when on p. 312 he wrote as follows:

“The cave Cashmeer Ghar, situated in the territory of the Baboozeis, on a mountain which cannot be ascended but by a steep passage, hewn in a great measure out of the rock. This place is also called Pelley, and is sixteen koss from the town of Soukhor. The cave is said to be of an immeasurable depth, and to have so large an aperture that it is impossible to discern the direction by casting in a stone. As both sides of the entrance are of solid masonry, and the front is encumbered with enormous cut stones, one would imagine that it is one of the subterraneous temples attributed to the Pandoovans, or to the Caffres. At present it is a place of shelter for myriads of wood-pigeons. Quite close to it are visible the traces of a town or castle whence idols are sometimes dug up; a basin also is observable there, continually supplied with water. I had been assured that an inscription was discoverable, but my men could trace none whatever.”

I transfer the passage in order to correct a few of the statements, as General Court was entirely dependant on information derived from natives. The cave is not hewn out of the rock, but is almost altogether natural. The place is not called Pelley. He must have confounded it with a place of that name, some miles to the north of Bábúzai, not within British territory, which I was told by the Afghans is remarkable for extensive ruins and mounds. What General Court calls Soukhor, is undoubtedly an error of type or a mistake of the pen for Lund-Khor; but this town is hardly more than *ten* miles to the west of Bábúzai. How the name *Kashmirí Ghár* or *Kashmirí Smuss* (both *ghár* and *smuss* being Pushto for cave) originated, is perhaps hard to tell. The idea of the natives is, that the extent of

the cave cannot be measured, but that the opening at the other end of it is in Kashmir. The last portion of the ascent to the mouth of the cave itself is extremely difficult. The cave consists of several chambers of unequal size; the outer one, which is very lofty, is distinguished only by a very few stalactites. The interior contains flights of almost uncountable steps, and buildings, whose nature cannot, however, be fully ascertained without some excavation. But such a work presents here unusual difficulty, not only on account of the comparative inaccessibility of the place, and its distance from the nearest village at which labourers could be obtained, but also because pigeons' and bats' excrements have accumulated in the cave for centuries. Two inscriptions were spoken of by the natives as existing somewhere in the cave, but I did not see them. Indeed, the only inscription which I have seen anywhere during this tour, is on an unshapen piece of rock lying at the entrance of the village of *Zeda*, in the south-eastern corner of the Yusufzai plain. The character is Bactrian, as well as I was able to see, the stone lying under a great heap of manure, upside down, and with the inscribed surface towards a wall. I was not able, during the day that I was at *Zeda*, to obtain a facsimile or even a copy of it. On various terraces and natural plateaus below the Kashmirí Smuss there are numerous remains of buildings very much like those at Bahai as well as like those on a hill near *Naográh*, between the British frontier and the Indus.

One of the most marked features among the remains on this latter hill (it is about 1000 feet high) are very large rocks and boulders scattered about, which have been carefully excavated for cells; many of these are quite plain inside, whilst others have the simple ornament of a niche or two. The summit of the hill offers a flat plateau of some size, which had been very strongly fortified by buildings all round the brow. These buildings are constructed of large blocks of stone (conglomerate, found on the spot) neatly hewn and carefully fitted, disposed with very great regularity and laid in a cement of extraordinary excellence; unavoidable interstices between the large blocks are filled up by layers of thin small stone tablets; this latter practice being an invariable feature in all the so-called Kafir buildings which I have seen in the Trans-Indus country. To judge from the smooth turf and the vegetation in the middle of the plateau, it

is highly probable that the space in the middle was not built upon except one spot very nearly in the centre, where there seems to have been a shrine or an altar.

One of the best preserved buildings at a corner of this plateau still exhibits some chambers which convey a good idea of the internal structure of these ancient remains. A gateway with a pointed arch leads into a long chamber whose ceiling is formed by a prolongation of the arch of the gateway. The arch would be pointed, but the centre line is taken up by a narrow rectangular groove. This circumstance leads to the supposition, that the arch is not a true arch, but is formed by the stones being disposed on one another in the form of steps, whose lower corners were eventually cut away. There is another chamber, accessible from the long passage through a low opening, but it is quite dark, and to a great extent filled with rubbish; whether it was left dark intentionally, or whether superincumbent ruins are closing up what may have been an opening, I could not ascertain without digging. A similar passage and chamber (or rather two chambers opposite each other) are also found on Bahai. On the plateau are found multitudes of figures in fragments, many of them, perhaps most, being the figure of Buddh (Sakya Muni) with his smooth, placid face, in his simple robe with ample picturesque drapery, elongated ear-lappets, and a halo round his head. The figures are either standing, or sitting cross-legged, with the bare soles of the feet turned upwards; the hands are frequently crossed over the breast, so however that the tips of the fingers of the left hand enter the hollow of the right; sometimes the hands rest in the lap; sometimes the right hand is lifted up as if in the act of blessing.

These figures are of dark blue or greenish slate of great brittleness, though not friable; they are of all sizes up to colossal. Then there are multitudes of haut-reliefs, but few of any good degree of preservation. The vegetation on the hill is principally olive and myrtle. At the foot of this hill to the north there begins a series of low mounds extending far into the interior. A very few of these in the immediate vicinity of the frontier have been partly excavated through Captain Shortt, Assistant Commissioner, and sculptured remains from these mounds are now in Hoti Mardán, and in the museum at Peshawur. A few of these have been photographed by two officers, and I enclose copies of them.

No. 1. A slab 13·14 inches in width, and $8\frac{1}{2}$ inches high, considerably abraded, representing a domestic scene. The execution is unusually coarse. The first and third figures from the right are evidently females; they have shoes on their feet, whilst the figure between them with the right hand lifted up, has the feet bare. The first, second, and third figures on the right have all earrings; the sitting female has a chadar over her head. The first and second figures on the right are seated on a bolstered couch, each having a footstool. The seated male figure has an ornamented head-dress, a necklace, and another ornament going over the left and under the right shoulder. The standing female figure has what appears to be a towel in her hands, which may be connected with the nude child on the knees of the next sitting bearded figure, the upper part of whose body is also nude: he appears seated on a mora. The next is also a male figure, but much mutilated. The ornamental architecture forming the ceiling of the room, cannot fail to strike the beholder.

No. 2. The figure of a king—four feet five inches in height.

Hindu dress; tilak on the forehead, smooth chin, neat moustache, elaborate earrings. The head is covered with strings of pearls and precious stones, presenting in front the shape of a diadem or crown, whilst the two ends of a fillet appear on the circular plane behind the head. Four different strings of ornaments, such as are still worn by Hindus, are suspended from his neck. A very rich necklace, encircling the neck, is of precisely the shape and workmanship which belongs to those one sees now worn by the higher officers at the Court of the Maharajah of Kashmir. A longer string lies over the necklace, and is fastened, over the breast-bone, by a richly worked clasp consisting of two open-mouthed animal's heads. Two other strings with amulets come from under the necklace, the one thrown over, the other under the right shoulder. The figure has also amulets on both arms, and two bangles on the wrist of the left hand. The right hand is broken off at a place where most of the figures found have the hand, which is made of another piece, joined to the arm; usually where there is a joint of this kind, it is very skilfully and artistically managed. The dhoti and chadar fall in rich and graceful folds, the latter ending in an elaborate tassel. There are sandals on the feet held by a string. The pedestal presents an altar or large urn in the centre, with two human figures on each side,

those on the right and one on the left in the attitude of supplication, whilst the remaining one on the left appears to bring an offering. Squat square pilasters form the two ends of the representation.

There are many other figures of this kind, of greatly varying sizes which have been found near Naogram as well as near Tahkal.

No. 3. A slab 20 inches in width, 13 inches high.

The execution is better than that of No. 1, and only the figures at the ends are slightly mutilated. The centre figure is a colossal Buddh in the usual unadorned dress, his waving hair gathered in a top knot, the lobes of the ears much elongated, a halo round the head, and feet bare. The left hand, as is usual, holds a part of the robe in a knot; the right hand appears to be taking a snake out of a bush of gigantic flowers growing out of a piece of water. Facing the Buddh is a figure whose dress is very similar to that of the statue No. 2, his hands folded, in the attitude of supplication. The figure between these two, under a tree, has the right hand raised very much in the manner of a modern military salute. The figure close to the left hand of the centre figure is one which occurs frequently in the Naogram haut-reliefs: an aged bearded soldier, nude to the waist, hair *au naturel*, a short broad sword by his side, his right holding an axe; the handle of the latter is gone, as about half of the pedestal of the slab is broken off.

No. 4. A slab 19 inches in width, 12 high.

A Buddh sitting cross-legged on a bolstered pedestal, his right hand lifted up as if in the act of blessing or teaching, a heavy festoon of flowers surrounding the halo. Seven male figures on his right, and six female figures on his left fill up the rest of the slab. Of the male figures three have their hands folded, as in the attitude of supplication; two others of the lower line appear to bring presents. The long waving hair of the two figures nearest to the right hand of Buddh is noteworthy. Of the male figures two have moustaches, the farthest in the lower line, and the nearest in the upper. Of the female figures two have anklets, all have bracelets; the nearest figure in the lower line appears to bring a present, whose nature it is difficult to determine. The execution is not neat, and the hands and feet appear disproportionately large.

No. 5. A slab 14 inches wide, 9 high.

In the centre is a bearded figure, nude as far as visible, a Brah-

minical string (apparently) over the left shoulder. The figure appears standing behind a table with carved legs, the carving on the two legs which are visible not being precisely alike; in front appears the drapery of a table cloth; on the table are five round objects, the bearded figure seeming to hold a sixth of the same description. In front of the table there is a small object on a pedestal, which closely resembles what appears from other sculptures to be a fire-altar; the upper portion of the top forms a cover, which hangs by a hinge from the side of the vase-like lower portion of the top, from which a flame seems to issue. The figure on the right hand of the central figure is dressed in an ample-sleeved shirt, which is confined round the loins by a girdle with a clasp in front; trousers, shoes, and a turban with pendant end complete the dress of this figure, a dress, moreover, which may be seen, at the present day, worn by the hillmen one meets with in Kashmir. A palm tree is visible behind this figure. The figure on the opposite side is dressed in the usual ample Asiatic robe and sheet, the feet bare: the left hand bears an undistinguishable object. The two figures in the background have lost their faces. The figure in the frame stands on a vase-like pedestal and has the hands folded. This slab, taken in connection with other sculptures, belonging to the same building doubtless, offers a curious combination of the elements of various religions: the tilak, the brahminical thread, and the fire-altar, together with that ubiquitous Buddh!

No. 6. A panel filling up a pointed arch; width at the base 26 inches, greatest height 25 inches.

Three subjects divided by ornamental lines, the outer one bordered by a palm trunk.

The lowest represents Buddh sitting on a bolstered pedestal, which latter is ornamented by a wheel; palm leaves over his head. Four male figures on each side in the attitude of eager listeners; three of these on the one side, and two on the other have their heads and faces shaven smooth; their ears are natural, that is, the lappet is not extended by any ornament; the figure nearest to Buddh's uplifted right hand, represents an old man with a long beard.

The scene above this, shows Buddh standing in the centre; what appears to be a king kneeling before him on his right knee, with hands joined in the position of a suppliant. Five figures behind the king, dressed in a similar way, also appear as suppliants, the last

reclining on one knee. The other side shows six figures; of the first the head alone comes out distinctly and bears a close resemblance to that of Buddh; an armed man lightly clad is the next figure; a shaven figure in simple dress the next; this is followed by three figures with ample hair and locks, dressed like the figures on the opposite side, the last again reclining on one leg.

The centre of the scene at the top is filled by a large urn on an ornamental pedestal and under a canopy. This appears to be worshipped by the figures on both sides, the last of which, on each side, surpasses Horace's imagination, since the upper part is a nude human figure, and the lower what may be called the coils of a dragon with dragon's wing and horse's foot, ending in a gigantic leaf by way of tail!

There are two more figures with hands joined near the bottom of the slab, supported by Corinthian capitals: these figures, much alike in dress, ornament, and attitude, as they are, differ as to their head-dress, the one on the right having flowing hair and a halo, and the other what appears to be a carefully twisted turban, and no halo.

No. 7. A slab being a piece of one side of a square pillar; it is 30 inches long; width 13 inches at the base, 11 at the top. Five compartments, three with Buddh sitting, two with Buddh standing; the halo is distinct in all but the topmost one. Of the four figures beside Buddh in the lowest, two appear in the attitude of suppliants; whilst the other two are bringing presents apparently. In the next above, one of the shaven figures reappears; the figure next to this is too much mutilated to be recognized, and so is the object held in the right hand of the figure facing Buddh. In the third compartment the figures approaching Buddh appear to bring presents as in slab No. 4. In the second compartment from the top the figures are much mutilated; so they are in the topmost one, but it can easily be distinguished that the two figures nearest Buddh offer presents which are carried by their followers.

The two ends of each of these five compartments are formed by pilasters with nude children in different postures. The sides of the slab itself (the slab being about two inches thick) continue the same pilaster-ornament.

No. 8. A figure of Buddh, 19 inches in height what there is of it, as the feet are wanting. The right hand having been joined on to

the arm, has been lost. Multitudes of these figures, in sizes varying from the neatest miniature of a few inches, to colossal figures 9 or 10 feet in height, are found everywhere.

No. 9, is the slab roughly described in my previous communication. It is 22 inches long, and $11\frac{1}{2}$ in width.

No. 10. A slab representing a sacrifice, apparently. It is 11 inches high, and 10 wide. The slab is broken in two in the centre. A carefully executed scene of much interest. The building on the left is precisely like a good number of well preserved ones at Bahai. It is represented (as those in reality are) as built of hewn stones, with a low entrance in front. In Bahai this lowest part of the building is usually square, as Rémusat describes the sthupa from the Fa houa wen kiu; but in this haut-relief it appears with rounded corners. The rest of the representation does not differ from the rest of the same kind of building in the ruins. A narrow, slightly sloping, rounded half-dome surmounts the base, itself surmounted by a short cylinder; on the top of this is a cupola with a small knob for its apex. In the buildings of this sort on Bahai the knob is wanting, and an opening appears in its place. In this representation a fire is perceived to be burning inside the building, as flames issue at every opening, and the figures about it, six in number, appear all engaged in pouring oil on the fire. The lowest figure on the left, with its back to the spectator, and a curly head of hair, is dressed only in a dhoti and is lifting a jar from the ground. Half the jar is broken off. To the left above is a similar figure on a ladder with a jar inverted in his hands, as if in the act of pouring out the contents on the roof. On the opposite side, an old, bearded, faqir-like looking man, his hair dressed precisely as the Sikhs dress theirs at the present day, clothed in a shirt, and carrying a crooked pole in his left hand, is pouring, with his right, the contents of a bottle on the lower roof. Next to this figure is a man of smaller stature, otherwise very like the last, with a smaller bottle in his left hand. Behind the latter faqir is a stout, curly-headed figure, dressed in a dhoti, standing on a ladder, in the act of taking a large jar from another figure, who is carrying it on his left shoulder, and holding it with his right hand passed over his head.

No. 11, the figure of a king sitting was excavated by Lieut. Johnstone from a mound near Lower Tahlkál, a village between the Peshawur

wur cantonment and the Khyber Pass. The statue, as it may be called, is 44 inches high, and 23 wide across the knees.

The figure is considerably mutilated, the entire right side above the knee of the principal figure, and the heads of three of the small ones being wanting; but what makes the figure remarkable is the suggestion, which one is struck with on looking at it, of its being probably a portrait. Many other figures with precisely similar dress and ornaments have been found in most of the places where figures have been found at all; but all the others present a smooth handsome face of great regularity of features, without much expression, as if the artists had only intended to produce some ideal or conventional head. The face of this figure, however, is far from being handsome or regular; there is a sternness in its mouth and chin, and a certain fierceness in its prominent eyes; the natural fall of the heavy moustache also contrasts strongly with the waxed little ornament of the upper lip found in the other figures of this kind. The whole head is covered by a richly wrought combination of strings of pearls with variously shaped and sized representations of precious stones; a lion's head over a heavy pearl garland surmounts the left temple. The lobes of the ears are much elongated by heavy pearl earrings. One lock of hair is visible behind the right ear. A necklace, and another ornament falling over the left shoulder relieve the nude thorax. A thick festoon of flowers seems, from its large curve, to be hanging over both shoulders and down in front. The legs are covered by a dhoti, and an izárband is visible in the middle. The bangled left hand (rudely worked) holds a heavy javelin to which a bell is tied. The left foot rests upon a footstool.

The four small figures are enigmatical from being so much mutilated. The figure sitting on the same couch with the king near his left knee is very coarse. It is quite nude, but has a fillet, a necklace and anklets: it leans forward, with its hands upon its breast. The standing figure below is headless; its breast and shoulders are covered with scale-armour: a short petticoat goes from the loins to the knees, and greaves cover the unamutilated legs; as there are no toes visible, the feet, in the intention of the artist, are represented as covered by shoes. The right hand bears a bunch of the same flowers of which the thick festoon is composed. The left hand carries something indistinguishable. The upper figure on the right of the king is also nude; the lower covered by a dhoti kneels on its right knee.

No. 12. A slab found near Jamrud, the dismantled fort at the mouth of the Khyber. It is 24 inches in height, and 18 wide.

Harem scenes. In the lower compartment, a male figure in the usual dress of Buddha and with a halo round his head is seen sitting on a couch, his left foot supported by a footstool. Behind him lies a female sleeping. Behind the sleeping figure another female figure is visible. The central figure seems to be about taking something from the hand of the figure on his right. Below are two women reclining on what appear to be drums. A lattice forms the upper ornament of the chamber, and above the lattice appear four human heads and the head of an ox; two of the human heads have halos, and the other two have the same kind of cap or turban with which the female figures below appear to be covered. Pillars separate the centre apartment from two arched passages or gateways at the sides; over each arch appear two birds. In each of the gateways there are two women, possibly as sentries, one of them holding a spear.

The upper compartment has suffered much from mutilation. The principal figure, apparently the same as the central figure in the lower compartment, is seen reclining on a couch, his face directed towards a woman sitting on the same couch, her feet supported by a footstool. The woman sitting on the ground appears to be beating two drums with her hands. The female figure behind is holding aloft a round object in her right hand, which may also be a musical instrument. Outside the pillars supporting the arch of the centre apartment appear three women on each side. One on the left is entirely peeled off; another, standing, appears to be playing a wind-instrument; the action of the sitting one is indistinguishable. The sitting female on the right appears playing a stringed instrument; the action of the other two cannot well be made out.

Before concluding this communication, I shall venture, though with much diffidence, to say a word on one of the most vexed questions among all the perplexing ones referring to the ancient history of the regions near the Indus, and that is, the identification of *Aornos*, the height which it cost Alexander so much trouble to take. It may seem presumption to renew the discussion of this subject after the full treatment it has received in this Journal (Vol. XXIII. *Gradus ad Aornon*) in Colonel Abbott's able and elaborate article. And yet, few attentive readers of that article can be satisfied with

the conclusion ; indeed, there is sufficient evidence that the writer himself was not satisfied with the conclusion, and that he gets rather out of patience, and that justly, with his authorities, Arrian and Curtius. Without absolute violence, it is quite impossible to reconcile their discrepant statements ; and not only are their statements utterly discordant as to the locality, but the most discordant points are found in one and the same writer.

As to the general locality in which Aornos is to be sought, most investigators, as indeed Col. Abbott himself, have found Arrian so vague here, that they have held to the more graphic representations of the imaginative Curtius. Yet no writer can be more inaccurate. His best friends have never been able to defend him from the charge of romancing. His own ideas, too, in reference to geography and topography seem so confused, that what little value may be accorded to his narratives, the want of proper and true localization deprives them of all value as portions of history. Only a few paragraphs before this chapter about Aornos, he speaks of Alexander's taking *Mara-canda*, which, from all attending circumstances, must be *Samarkand*, and in the very next breath he speaks of the Scythians of the Tanaïs (the Don) as in the same neighbourhood. In this very narrative about Aornos, which he places on the Indus, he makes Alexander fight for the place as only a very important place such as commanded a ford or passage, could induce him to fight, and then, he makes Alexander march sixteen more marches in order to cross the Indus.

The topographical indications, therefore, of the ancient writers, it must be confessed, have hitherto led to no satisfactory result in the search after the famous Aornos. May not another method of identification prove more successful ? The *name* Aornos can hardly be an invention of the Greeks. If the difficulties of Chinese transcription of Indian names have been so successfully overcome, may not a similar linguistic method have equally happy results, if applied to those names in Alexander's march, which have not been satisfactorily identified yet ?

What appears most probable in reference to the disputed locality, is this : that the place was on or near the Indus, that it was a height near plains, that the people of the plains considered it an impregnable place of refuge, that Alexander thought it of sufficient importance to make a very signal effort for its capture, and that its name was *Aornos*. To begin with the name.

Aornos must be the Greek transcription of a Sanscrit name, for all the other names which have been identified, have been identified through the Sanscrit, which therefore, whether the people then spoke it or not, was certainly the language of their names, and not only then, but for some centuries subsequent yet. In course of time the Sanscrit was worn down into Hindi, Panjabi, Pushto, etc. Hence if we wish to see how any place bearing a certain Hindi, Panjabi, Pushto or other name at the present day, came to be called so-and-so by the Greeks, we can only find it by referring the modern name back to its most probable Sanscrit predecessor or progenitor. Thus, the modern Behat was called Bidaspes or Hydaspes by the Greeks, because Behat is the modern short for the ancient Vitasta.

Now we find in the *Tabaqáte Akbari*, in the *Tarikhe Murassa*,* in other native works, and even from the mouth of Hindus at the present day, that the place now called *Atok* was formerly called *Atok Benares* (properly Banáras). The union of two names in this way may be explained in one of two ways. Either we believe, on the analogy of Kasi Benares as explained by Dr. Hall in No. 1 of last year's Journal, p. 5, that Benares was the name of the "circum-jacent territory" of Atok; or else, we adopt an analogy more in accordance with the custom along and near the Indus. We find, in this region, that when a locality is designated by two names mentioned together, it is either because there are two places bearing these names respectively close to each other, as Hoti Mardán, Tárú Jabba; or else, where there is a river, because they are on the opposite banks of the river, as Rorí Bakar, Thút Naka, Dághí Bánda, etc. etc. The latter analogy is evidently the aptest in the present instance; hence we conclude that in former days, there was a locality opposite Atok, that is, on the right bank of the river Indus, named *Benares*. The old form of Benares is, as is well known, Varānas (or Varanasi). How would a Greek of Alexander's age pronounce this name? He would, in the first place, prefix a vowel. Why? we can hardly tell without a discussion much too long for the present object. It will suffice to know that he was in the habit of doing so. The Sanscrit *danta* he pronounced ὀδόντα; *nakha*—ὄνυχα; *nama* (u)—ὄνομα; *bhrú*—ὄφρυς; *nri*—ἄνθρωπος; *s'atam*—ἑκατόν; *mih*—ὀμιχέω, and a hundred like instances which will readily occur to the reader. We

* A History of the Afghans, by Afzul Khan Khaṭak.

should then have the form *avaranas*. One of the commonest modes in which the Sanscrit syllable *va* reappears in other languages, is in the form of the vowel *o*. Thus

Sanscrit *dvār* = English *door*, German *thor*.

„ *vakshas* = „ *ox*.

„ *svan*— = Latin *son*—.

„ *svasar* = „ *soror*.

„ *svar* = „ *sol*.

„ *svarna* = Hindi *sona*.

In Greek some such change is doubly necessary on account of the absence of the sound *v* from the language (from the *κωνη*, at any rate); hence *svas* corresponds to *ὄς*, *s* being replaced by the breathing; *vāk*, becomes *ὄπ*-, etc. Then there is that immense class of perfect participles, which in Sanscrit are formed with the suffix *vāt*,* corresponding to the Greek form in *ὄτ*-, and many other instances. On this principle *avaranas* becomes *ἄσπος*, losing one vowel necessarily by the recession of the accent.

We should therefore have to look for Aornos opposite Atok. With reference to this locality General Court has observed “that a rock exists opposite Atok, with all the peculiarities described by Q. Curtius, on a mountain that is topped by a castle, attributed to Rajah Hody. It cannot be ascended but on the side of the Indus, by a steep passage hewn through the rock, and enclosed by two walls of defence, running up zigzag according to the protuberances of the mount. The space inclosed by these walls is filled with ruins of habitations gradually rising from the brink of the river up to the castle. Those works are all entire, and have the appearance of great antiquity.”

Much of this is true even now, though it is highly probable that many of the “habitations,” of which General Court speaks, as well as the “castle” itself, have been removed to build Sikh Forts in the same locality, since he saw the place, if he saw it at all himself. There are ruins of buildings, but they are few. However, the outer wall of the whole Fort is distinctly traceable. It runs down to the river on two sides; the space enclosed is at least three times as large as the Fort Atok, and the wall to the west, north, and south evidently overhung steep places. The walls are smooth and even, and in general appearance allied to the Buddhist remains in Yusufzai.

[* As in *dadri'svāt*—and *τετυφώτ*.—Eps.]

I may add the opinion of one of the highest military authorities that Mahabun, which Col. Abbott proposed as Aornos, commands nothing; it is so much out of the way that it would hardly ever have been a place of refuge for the people of the plains; and if it had been, a general like Alexander would not have wasted his time and his men on the reduction of an isolated hill which was by no means impeding his passage of the Indus. On the other hand he says that the hill above Khairábád is not only a most conspicuous point for friend and foe, but also one that must be taken before a passage of the Indus at Atok would be attempted by an invading force.

I have only one item to add in reference to the tradition about Rajah Hody. This tradition still exists on the spot, and in other localities of Afghanistan. The topes and altars, for instance, in the neighbourhood of Amerakhel near the Surkhab, are attributed by the natives to Rajah Hody or Udi. Now *Saint-Martin* in the treatise cited above, finds three regions conterminous with one another, which, in Hiouen-Tsang's time, were called *Oudiyana*, according to his French spelling: the first as the capital of Ningrahar (p. 52); the second, the kingdom of Oudiyana, (p. 63), which he identifies as the plains and hills of Ashgaghar (Hashtnagar, though inveterate and official, is incorrect) and Yusufzai; and the third time he finds the name, it is applied to the region about Hasan Abdál, (p. 69). In each of these instances he says, the locality was called so, that is "a garden," on account of its fertility. It does not strike him as strange that precisely the same name should have been given to *three* adjoining regions, and these names should be entirely independent of one another. Moreover, Ningrahar is by no means a garden at all times. It is a locality which suffers famine frequently, and one of the derivations of its name as given by indigenous Mullahs, is based on the meaning "half-hungry,"—a derivation however little worth in etymology it may be, gives evidence at least of the native estimation of the fertility of the place. The plain of Yusufzai is a garden about once in three or four years; the rest of the time it is a desert.

It appears to me far more likely that these regions together were called by the *one* name *Udiana*, as being the kingdom of this "Rajah Udi." Names of this form and thus derived are frequent in the

Panjab, for instance, Lodiana, Luliana, Duliana, Gurjiana, Hariana, Phubiana. Whether Udi, or Hody was an individual as Guru ji (of Gurjiana) or some Hari Singh (of Hariana) may have been, or a dynasty or family, as that of the Lodi (of Lodiana), I am unable to say. What I propose, I do not presume to dogmatize on. And I do not think that the name *Udiana* itself has entirely disappeared, as Saint-Martin supposes, but that it has probably been preserved in *Adina*, the name of a large village situated almost in the centre of the Yusufzais.

LITERARY INTELLIGENCE, CORRESPONDENCE, &c.

Professor Whitney writes from New Haven, U. S. A., December 30th, 1862.

"Our own labours are going on much as usual, at a moderate rate, owing to the absence of an abundance of resources, whether material or literary. I trust that you have not failed duly to receive all that we have forwarded to you, viz., the numbers of the Journal and extra copies of those of its articles of which separate editions have been issued. The forthcoming half volume is mainly occupied with my *Atharva-Veda Prâtis'âkhyâ*, which fills nearly 300 pages. Unfortunately the MS. material furnished for it was of the scantiest: it may be hoped that a second copy of the work will turn up some time in India. It may be that I shall go on to publish in a somewhat similar style the *Tâittiriya Prâtis'âkhyâ*, for which Professor Hall some time ago furnished me a fair supply of material. Our friend just mentioned, has written me that you informed him when he saw you on his return to India that you had access to a couple of copies of the *Gopatha Brâhmana*, and that you offered to procure to be made for me a transcript of the work from them. It would indeed be a great kindness to me if you would do so. I should also like much to know which of the more ancient *Siddhântas* (besides those already in print) you have in manuscript at Calcutta: I mean to resume by and by my studies in the Hindu astronomy, begun in connection with the translation, &c., of the *Sûrya-Siddhânta* given in volume VI. of our Journal."

Colonel Cunningham writes to E. C. Bayley, Esq., in a letter dated Camp *Gonda*, 20th February, 1863.

"I have been most fortunate this season in my identifications of the ancient sites. The fact is, that I have had time to read and compare the authorities beforehand, and so I was able to make up my mind as to where to look for most of the places. I marked them down like quail, and then marched up and bagged them. *Ahichhatra* is a valuable discovery, as the place was of great consequence in the early days of Indian history. It is the *Adisadpa* of Ptolemy, and was the capital of northern Panchala. I intend to finish the excavation of its large Tope during next month.

In the Khalsi inscription of Piyadasi the letter "r" is not used, hence the name of Alexander is written as *Alikyasadale*—at least so I read the name, for it contains a curious compound letter † which I take to be *ky*. The inscription in this portion is certainly different from those of Dhauli and Kapurdigiri and Gujrat. The names of the subject countries follow immediately after those of the Greek Kings—commencing with *Choḍa Pandiya* (not *Pida* as hitherto given). On the opposite side of the rock, there is an elephant boldly cut in outline, and between his legs the short inscription *Gajatame*, which may perhaps be "The Black Elephant," in contradistinction to the *Sweta hasti* of the Gujrat inscription.

At Kosam there is an immense ancient fortress with a stone pillar of the same dimensions as those of Delhi and Allahabad, but it bears no ancient inscription that I could find, although I dug to a depth of upwards of seven feet all round it. There is however a record of Akbar's time, in which a pilgrim calls the place *Kosambi-pura*. That Kosambi was on the Jumna see the legend of Bakkula who was dropped by his mother into the *Jumna* at *Kosambi*, and was floated down the stream to Benares.

Hwen Thsang's *Kia-she-pu-lo* is Sultānpur of which the old Hindu name was *Kusabhavanapura*, or simply *Kusapura*.

Hwen Thsang's *Pi-so-kia* or *Visākha* is the same as Fa Hian's *Sha-chi*, and also the same as the *Sāket* of the Pali annals. It was no doubt called *Visākha*, after the celebrated lady *Visākhā* who was a native of *Sāket*; and I presume that her name was held in estimation for centuries afterwards, as I refer the coins of *Visākha Deva* and *Dhāna Deva* to princes of Ajudhia who were named after the

original Buddhist lady Visâkhâ and her father Dhananja. *Sâket* was *Ajudhia*, I have already come upon sprigs of the toothpick tree which Buddha planted at Sâket. Both are called *Datton*.

Srâvasti, or *Sâvatthi*, or *Sâwet* or *Sewet* I expect to find at Sahêt-Mahet, where I shall arrive on the 23rd. According to the Purânas Srâvasti was in *Gaura*—and this is *Gaura* where I am now writing! Our military spelling is only equalled by our military pronunciation. There is no such place as *Gonda*—all the people of the country call it *Gaura*—and the old name of *Balrâmpur* was *Râmgarh Gauri*. These identifications render the whole of Hwen Thsang's route clear and satisfactory—and in Fa Hian's route we have only to read twenty *yojans*, instead of ten *yojans*, from the *Holi* forest near Kanoj to *Sha-chi* to make his account tally with the other. The Singhalese annals give twenty *yojans* from Kanoj to Sewet. Nothing can be more complete."

PROCEEDINGS
OF THE
ASIATIC SOCIETY OF BENGAL,
FOR JANUARY, 1863.

The Annual General Meeting of the Asiatic Society was held on the 15th instant.

A. Grote, Esq., President, in the chair.

The Secretary read the following Annual Report for 1862:—

ANNUAL REPORT.

The Council of the Asiatic Society, in submitting their annual report for the past year, have the satisfaction of again congratulating the Society on its increasing prosperity both in respect to the increase of members and the improvement of its finances.

During the year 1862, there has been an accession to the Society of 44 members, while the loss by death and retirement, amounts to 12. The number of ordinary members at the close of the year was 311 against 281 of the preceding year. Of the ordinary members on the roll, 82, or more than one-fourth are absent from India, leaving 115 Resident and 114 Non-Resident members on the paying list.

Annexed is a tabular statement shewing the fluctuation in the number of the ordinary members during the last ten years.

	Ord ary.	Pay g.	Abs it.	
1853	146	123	23	Of the deceased members, Bábú Ramá- prasád Roy had been for some time a member of the Council, and a Vice-Presi- dent, and was distinguished for the interest which he took in the prosperity of the Society. Dr. Crozier had been for three years a member of the Council. The other names in the obituary are the Hon'ble W. Ritchie, Rajah Prosunno Nath Roy, E. A. Blundell, Esq., Bábú
1854	155	129	26	
1855	162	128	34	
1856	167	131	36	
1857	147	109	38	
1858	133	193	38	
1859	180	135	45	
1860	242	195	47	
1861	281	226	55	
1862	311	229*	82	

* Of this number, one has
compounded for his sub-
scription.

Jogíndra Náráin Roy, and T. E. B. Judge, Esq.

FINANCES.

The Gross Receipts of the Society during the year amounted to				Rupees 15,631-5-6, and its Expenses to			
1852	6,373	1	3	Rupees 15,979-13-5. The receipts on			
1853	7,778	9	3	account of Contributions from members			
1854	7,082	0	0	were Rs. 8,822-9, of which Rupees 1,600			
1855	7,166	0	0	were for Admission fees and the balance,			
1856	8,096	0	0	Rupees, 7,222-9 for quarterly subscriptions.			
1857	7,068	0	0	The latter sum is considerably in excess			
1858	6,923	8	0	of what was collected during the last year,			
1859	6,750	0	0	as well as of the average collections of the			
1860	6,441	0	0	previous ten years, as will be apparent			
1861	6,812	0	0	from the table annexed in the margin.			
<hr/> Total Rs. 70,490				2	6		
<hr/>							
The average of which is							
Rs. 7,049-0-3 per year.							

The Liabilities of the Society amount to Rs. 4,274-0-2 chiefly due to printing charges, while the Assets amount to Rupees 7,113-1-9 exclusive of outstanding balances to the extent of Rupees 5,719-11-2, the greater portion of which is for unrealized subscriptions in course of collection. A large sum under this head, Rupees 1,381-2-7 has been written off to profit and loss as un-realizable.

The income of the Society has received a permanent addition since April last of Rupees 200 per mensem granted by Government for the support of the Natural History museum.

The probable income and expenditure of the Society for the next year may be set down as follows :—

Income.

Contributions,	...	...	Rs. 8,000	0	0
Admission fees,	...	...	...	800	0 0
Journal, ...	...	...	...	728	0 0
Library, ...	...	...	...	500	0 0
Museum, ...	...	...	...	6,000	0 0
Secretary's Office,	...	...	...	11	0 0
Vested Fund,	...	...	...	245	0 0
Coin Fund, ...	...	...	...	45	0 0

Rs.... 16,329 0 0

Expenses.

Journal, ...	...	...	...	2,500	0	0
Library, ...	...	...	...	2,046	0	0
Museum, ...	...	...	...	7,120	0	0
Secretary's Office,	...	...	...	1,855	0	0
Building, ...	...	...	...	389	0	0
Vested Fund,	...	...	...	7	0	0
Coin Fund, ...	...	...	...	357	0	0
Miscellaneous,	...	...	...	487	0	0

Rs.... 14,761 0 0

LIBRARY.

Important additions have been made to the library during the past year, amounting to 550 vols., more than half of which were presentations from various British and Continental Societies, and from distinguished individuals with whom the Society is in correspondence.

Several interesting scientific books were likewise purchased at the sale of the late Dr. Walker's valuable library, among which may be noticed a splendid set of the *Description de l'Egypte* published by order of the Imperial Government of France.

A catalogue of the inscriptions published in the *Researches* as well as in the vols. of the *Journal* subsequent to Vol. XXIII. has been prepared by the Librarian. To this has been annexed, by way of appendix, a short catalogue of inscriptions presented by the late Major Markham Kittoe, but not yet published.

COINS.

The Numismatic cabinet has received some valuable additions chiefly through the kind exertions of Captain F. W. Stubbs. Mr. Bayley was for some time engaged in effecting a systematic arrangement of the coins, but the press of official duties, the Council regret to observe, has prevented his making any great progress in the undertaking.

MUSEUM.

The Museum has been enriched by a number of valuable contributions, during the year under review.

The Archæological department of the Society has received several

figures and plinths of pillars in red sandstone exhumed from a tope in the neighbourhood of Muttra, some of them containing inscriptions bearing the name of Huvishka, under whose auspices it is believed the *vihara* or monastery of which they are but fragments, was raised. They attest to a period when Buddhism prevailed throughout India.

The Council, acting upon a proposal by the President for pushing forward Ethnological researches have commenced a collection of crania of the races inhabiting India, and the neighbouring countries. A series of photographs prepared under the orders of the Bengal Government has also been received, which, together with the facial casts now in the Museum, will yield most useful materials for future reference by ethnologists.

At the suggestion of the Committee of Meteorological and Physical science, the Council have addressed a letter to Government recommending that a Meteorological Committee should be constituted by Government on the plan of the Meteorological Committee of the Board of Trade in London, for the advancement of Meteorological science, by which means, it is hoped, that much practical benefit would be conferred upon the mercantile world. No answer to this letter has yet been received.

They regret to notice that the Right Hon'ble the Secretary of State has declined to comply with their recommendation that the Zoological catalogues of the India House Museum which were in course of preparation should not be discontinued.

The catalogue of mammalia in the Society's collections, the Council are glad to report, has at length been completed and is now in the press.

The subject of the foundation of a Public museum in Calcutta which the Society first proposed in 1857, the Council are glad to report, was taken up by Government in May last with a view to its practical realization. In the letter received from Government, an outline of the measures which it was proposed should be adopted, was submitted for the consideration of the Society.

The Council in reply to this important communication have forwarded a scheme which in its essential features is in consonance with the views propounded by Government, but at the same time they have distinctly reserved to the Society full power of dealing with the details of the scheme before they are finally settled.

Public interest is still		increasingly attracted by the museum as
NATIVES.		will be manifest from the annexed memo-
• Male,	84,885	randum which shows an average of 258
Female,	5,754	visitors per diem.
EUROPEANS.		
Male,	2,746	
Female,	1,003	
<hr/>		
94,388		
Average being 258 per day.		

OFFICERS.

The Council have learnt with extreme regret that the Society's solicitation for a reconsideration of the decision by which their curator, Mr. Blyth's application for pension was held by the Home Authorities to be inadmissible, though warmly supported by the Governor General in Council, has not met with the success they had anticipated. The pension solicited has been again refused by the Right Hon'ble the Secretary of State for India.

The continued indisposition of Mr. Blyth, which indicated a constitution broken down by protracted residence in this country, has obliged the Council to grant him leave of absence for a year, on full pay, in order to enable him to proceed to Europe for the benefit of his health.

In Mr. Blyth's absence, the selection of a competent man to replace the late Bábú Rajkisto Banerjca, who had been for some months employed as an Honorary Assistant Curator, and who had in that capacity proved himself extremely useful, is a task of much importance and considerable difficulty.

The Assistant Secretary and Librarian continues to discharge his duties to the entire satisfaction of the Council.

JOURNAL.

Four Numbers of the Journal have been published this year and a fifth is in the press. They contain several very important papers relating to the history, the antiquities and the natural history of this country.

BIBLIOTHECA INDICA.

The Bibliotheca Indica has been continued during the past year with the same vigour on the part of its different editors as in the previous year. Thirteen numbers have appeared of the old series and seventeen of the new.

In the new series, Dr. Hall has published the second part of the

Das'a Rúpa, a third will complete the work, which will be accompanied by an appendix containing those parts of Bharata's Nátya S'ástra which go over the same ground. Pandit Prem Chandra Tarkabágish has published two fasciculi of his edition of the Kávyádars'a of S'rí Daṇḍin; the Rev. K. M. Banerjea two fasciculi of the Nárada Pancha Rátra, and Mr. Cowell the first part of the Maitri Upanishad. There have also appeared two fasciculi of translations,—the second part (concluding the work,) of that of the Siddhánta S'iromani, by the late Lancelot Wilkinson, Esq., revised by Pandit Bápu Deva, and the first part of Dr. Ballantyne's translation of the Sánkhya Aphorisms.

In the series of Muhammadan historians of India, we have to announce the completion of the Táríkh-i Ferozsháhi of Ziá-i Barní, and the Táríkh-i Masaudi of Baihaki.

In Arabic, Captain Lees has published the Nokhbat al Fikr wa Nozhat al Nazr, complete in one fasciculus.

In the old series, we have to announce the completion of three of our old publications, viz., the Dictionary of Technical Terms used in the science of the Musulmans, and the Pseudo-Wakidy's Conquest of Syria, both edited by Captain Lees, and the Márkandeya Purána, edited by the Rev. K. M. Banerjea. The Council refer with pleasure to the remark in the last report of the Asiatic Society of Paris, relative to the first of these works,—*ce dictionnaire sera une des publications les plus utiles de la Société*.

Bábú Rájendralál Mitra has issued five numbers of the Taittiríya Bráhmāna, of which the third volume is now commenced.

Mr. Cowell has published two parts of the Taittiríya Sanhitá and Pandit Rám Náráyan Vidyáratna three of the Vedánta Aphorisms.

The titles of the fasciculi of the old series published during the year are,—

1. The Dictionary of Technical Terms used in the Sciences of the Musulmáns, P. II. edited by Mawlavies Abdul Haqq and Gholám Kádir, under the supervision of Captain Lees, LL. D., No. 182, Fasc. XX.

2. Márkandeya Purána, edited by the Rev. K. M. Banerjea, No. 183, Fasc. VII.

3. Aphorisms of the Vedánta, edited by Pandit Rám Náráyan Vidyáratna, Nos. 184, 186 and 194, Fasc. VI. VII. and VIII.

4. *Taittirīya Sanhitá*, edited by E. B. Cowell, M. A., Nos. 185 and 193, Fasc. XVI. and XVII.

* 5. *Taittirīya Bráhmaṇa*, edited by Bábú Rájendralál Mitra, Nos. 188, 189, 190, 191, 192, Fasc. XII. XIII. XIV. XV. XVI.

6. *The Conquest of Syria* commonly ascribed to Aboo Abdallah Muhammad bin Omar al Waqidi, edited by Captain W. N. Lees, LL. D., No. 187, Fasc. IX.

The titles of the Fasciculi of the new series are,—

1. *Tarikh i Baihaki*, edited by the late W. H. Morley, Esquire, published under the superintendence of Captain W. N. Lees, LL. D., Nos. 21, 22, 26, 27, 29, 31, 36, Fasc. III. IV. V. VI. VII. VIII. IX.

2. *Tarikh i Ferozshahi of Zia-i Barní*, edited by Saiyid Ahmed Khan, under the superintendence of Capt. W. N. Lees, LL. D., No. 23, Fasc. VII.

3. *Das'a Rúpa*, by Dhananjaya, edited by Dr. F. E. Hall, No. 24, Fasc. II.

4. *Nárada Pancha Rátra*, edited by the Rev. K. M. Bauerjea, Nos. 25, 34, Fasc. II. III.

5. *Hindu Astronomy, II. The Siddhánta S'íromani*, translated by the late Lancelot Wilkinson, Esq., C. S. and revised by Pandit Bápu Deva Sástri, under the superintendence of the Ven'ble Archdeacon Pratt, No. 28, Fasc. II.

6. *Kávyádars'a of S'ri Dandin*, edited by Pandit Prem Chandra Tarkabágish, Nos. 30, 33, Fasc. I. II.

7. *The Sánkhyā Aphorisms of Kapila*, translated by Dr. J. R. Ballantyne, No. 32, Fasc. I.

8. *The Maitri Upanishad*, edited by E. B. Cowell, M. A. No. 35, Fasc. I.

9. *The Nokhbat al Fikr wa Nozhat al Nazr*, edited by Capt. Lees, and Mawlavies Abdul Haqq and Gholám Kádir, No. 37 complete in one Fasciculus.

The President then read the following address :—

The report which you have just heard, and which will I hope be adopted as satisfactory for the present state of the Society's affairs and as hopeful for the future, touches on one or two points which seem to me to claim special attention. With the meeting's permis-

sion I will, as I did at our last annual meeting, remark briefly on these while reviewing the record of our proceedings during the past year.

Two, perhaps, of the most interesting papers which have been contributed were those read by Major Walker and Major Montgomerie at our February and April meetings. Both supplied valuable geographical information on countries within and across our frontier,—information which was likely to fall within the reach only of officers employed, as they were, on the survey of our Indian Empire. Those of us who attended the April meeting and saw the photographic sketch of the large Baltaro and neighbouring glaciers that Captain Montgomerie then exhibited, must all feel equally eager for further communications from the officers engaged on the Kashmir series of that great survey.

One suggestion which on that occasion fell from Captain Montgomerie and which Major Walker is, I am aware, now discussing with the Government, I especially commend to the consideration and warm support of our Society. The field of Captain Montgomerie's duties brings him in contract with traders and travellers who pass without question beyond our frontier and who visit without risk those cities of Turkistan to which an European cannot safely penetrate. Why should we not, asks Captain Montgomerie, do our best to turn the services of such men to account? Some few among them he already knows to be partially competent and to admit of being made more so, and by cautious training on our part the ranks of such men may be increased. I have lately heard further from Captain Montgomerie on this important subject, and have laid his letter before the Council, which will deal with it at their next meeting.

Later in the year another communication was read by Major Walker, who, on that occasion, acknowledged the obligations of the Trigonometrical Survey to the investigations of Archdeacon Pratt. The result of those investigations, which have extended over some years, and the value of which has been more fully recognised in Europe than in this country, has been condensed by the Archdeacon in a *memo.* which was published in the 2nd No. of our Journal, and was concisely announced by him in the remarks which he made at our meeting on Major Walker's paper. It was to the effect that "the distances between places determined by the Survey are free from the effects of errors caused by local attraction;" a result which

leaves the survey maps as reliable as they were before the liability to error was first pointed out, and in fact as reliable as in the present state of science maps admit of being made.

Major Walker has also commenced the publication in our Journal of a series of papers bearing on the great work of which he now stands at the head, and I must again express my hope that every year may see our Society more closely connected with the officers of this and of the Geological Survey. To Mr. W. Blanford of the latter of these surveys we owe our first knowledge of the character and probable age of the volcanic peak of Puppa Doung beyond our Pegu frontier. Mr Blanford's paper on this volcano, Major Sherwill's account of his and Dr. Simpson's attempt to reach Kinchinjinga, Captain Raverty's account of the upper and lower Swat, and the report by Captain Fraser and Captain Forlong of their expedition across the Isthmus of Krau, have given what I may call a geographical colour to the contents of our Journal for the past year which has doubtless made the issues acceptable to many.

To those of us too who took an interest in the projected expedition of Captain Smyth into Chinese Tartary, and who felt for him in the disappointment which he and his intended companions experienced when Government was obliged for the time to abandon it, it must have been gratifying to hear the assurance of H. M.'s minister at Peking, which was announced at our August meeting, that he was alive to the importance of the objects of that expedition, and would lose no opportunity which might offer of promoting them. Those of us, moreover, who joined the deputation to Lord Elgin on his arrival in India, are aware that he is as anxious as ourselves and as the enterprising men who were to have crossed the snows, to see all barriers removed to a free intercourse between this country and China. One of these barriers, and a most important one will, it is hoped, disappear under the late treaty with Burmah, and other difficulties may be removed by the joint British and Burman expedition, which it has been proposed to send *via* Bhamo to the Yunan frontier.

I may take this opportunity of announcing that I lately handed in to Government an application from Captain Smyth and Dr. Stewart for a year's leave to admit of their attempting to reach Lhasa on their own resources, and I am in hopes that should the difficulty in obtaining passports from Peking not be obviated, their application

may hereafter be complied with. The state of the border countries is at present somewhat disturbed, and I understand that the Governor-General thinks that it would be better, at all events, to defer giving the leave till a more favorable opportunity offers.

At our March meeting was read the correspondence which had been sent to us by the Government of India regarding the appointment of Colonel Cunningham as Archæological Surveyor, and which enclosed a memorable Minute by the late Governor-General. It must have been cheering indeed to the few among us who have persevered, in spite of every difficulty, in the study of mouldy coins and in the decipherment of imperfect inscriptions, to find the head of the Government acknowledging its past neglect of the services which they have rendered to the 'early history of England's great dependency,' and declaring its intention to neglect this duty no more. As bearing on those pursuits of our Society in which it was so deeply occupied a quarter of a century ago, and which earned for it the high compliment which was paid to it by Professor Lassen in the dedication of his great work on Indian archæology, I regard this declaration as the most important communication which has been made to us since my connexion with the Society. One of its results we may expect every day to see in Colonel Cunningham's first yearly report, and the grant which has recently been made by the North-Western Government towards pushing the excavations at Muttra, is probably another.

More than one paper which has appeared in our Journal during the last year will be read with interest by European scholars who have not, like ourselves, access to those remains of which we are the custodians. But more especially will they hail the proofs of continued activity on the part of their learned co-labourers in this country which are given in the long list of additions made during the year to both series, old and new, of our *Bibliotheca Indica*.

With no pretensions myself to being a scholar, I can well appreciate the importance attached at home to the labours of the Philological Committee of our Council, and the heartiness of the welcome with which European Orientalists must receive each printed text of a MS. rescued from possible oblivion. The thirty-two Fasciculi of different works, which the report mentions as having been published during the year at the charge of the Oriental Fund represent portions of works, which have hitherto been accessible in MS.

only in three or four public libraries—but which our publications enable students to carry to their own homes for the extraction and elaboration of such materials as are useful to them each in his own branch of study.

The series of Persian historians is one, in the progress of which I take a special interest, an interest borrowed from others, but not the less genuine for not being original. The late Sir H. Elliot and Mr. John Colvile, were the first movers, as is generally known, on behalf of the publication in question, which the active co-operation of Mr. E. Thomas had just pressed into a project when the troubles of 1857 caused all idea of it to be dropped. It was resumed some three years ago by the Philological Committee at the suggestion, I believe, of myself, since I, as your Secretary, had been all along in close communication with those friends whom I have just named. The first work, *Tarikh-i Ferozshahi* of Ziá-i Barní, which the Committee undertook to recommend to the Council, was that which was to have opened the series under the auspices of the North-Western Government. I indulge in the hope that much may yet be done towards carrying out not only thus partially, but in its entirety, the task to which Sir H. Elliot had devoted himself, and which was occupying him when he died. The mass of valuable materials which he had collected, ought not to be allowed to remain longer inaccessible to the many who desire to consult and profit by them.

In the department of the natural sciences, the principal contribution to the pages of our Journal is Mr. Blyth's paper on the Asiatic species of *Rhinoceros*. Whether the views enunciated in this paper will find acquiescence from other naturalists, remains to be seen, but he has quite satisfied himself that the Soonderbun *Rhinoceros* is identical with the species of Java and Borneo.

The Messrs. Blanford still continue their contributions to Indian malacology. Several interesting letters and reports on zoological subjects have been published in the intelligence department and proceedings of each issue of our Journal. In the latter too will be found the Council's correspondence with the Government—so far as it has gone—on the proposed transfer of the Society's Museum.

In connexion with the Museum, I must express a regret which will be shared by many, at the causes which have deprived us for the time of the services of our zealous Curator. The Council, as you will be pre-

sently informed, took upon itself the responsibility of anticipating the assent of a general meeting to Mr. Blyth's departure to England. None hope more earnestly than myself that the voyage and consequent change may completely restore his health, and none can have read perhaps with greater disappointment than I have the unfavourable reply lately received to the despatch of the Supreme Government which was read to us at our July meeting and in which Mr. Blyth's claims, "as a man of science," were strongly and ably advocated. This reply has yet to be considered by the Council and communicated to the meeting, and I bespeak for the whole subject when it is laid before you, an especial consideration.

I have nothing more to add, but shall at once ask the meeting to adopt formally the Council's report.

Mr. Lewis Jackson seconded the motion.

Mr. Oldham moved as an amendment that the Report be adopted with the exception of the paragraph reporting the leave of absence granted by the Council to Mr. Blyth.

Mr. Oldham argued that the Council had contravened the rules by the course it had pursued in this matter.

After some discussion a shew of hands was taken when the amendment was rejected and the Report of the Council was adopted.

Mr. Oldham then handed in the following protest :—

"I protest formally against the illegality and informality of the adoption of that portion of the report of the Council which refers to the absence of Mr. Blyth, inasmuch as in direct contravention of the rules of the Society this resolution of Council which was passed prior to the December meeting of the Society was not reported to that meeting."

The meeting then proceeded to ballot for the Council and officers for the ensuing year.

Mr. E. C. Bayley, and Captain H. Hyde, were appointed scrutineers, and at the close of the ballot, the chairman announced the following result :—

COUNCIL.

Lieutenant-Colonel H. L. Thuillier, *Président*.

A. Grote, Esq ,

Lieutenant-Colonel R. Strachey, } *Vice-Présidents*.

Bábú Rájendra Lál Mitra,

Hon'ble C. J. Erskine.

Dr. J. Fayrer.

Captain W. N. Lees.

E. C. Bayley, Esq.

Dr. T. Anderson.

Bábú Ramánáth Tágore.

J. Obbard, Esq.

Dr. T. C. Jerdon.

T. Oldham, Esq.

W. S. Atkinson, Esq. } *Joint Secretaries.*

E. B. Cowell, Esq.

Lieutenant-Colonel Thuillier, on assuming the President's chair said he felt deeply the great honor that had been done him by the vote of the meeting, for which he expressed his warmest acknowledgments. Of the honorable members present none could have been taken more by surprise than he himself was, when he was first nominated by the Council, at which time he felt it his duty to urge as forcibly as he was able, the various good reasons against his being selected to fill such a post, for which he feared he possessed but very few qualifications. There were, he knew, other members of the Society who could and would render far better service than he ever could hope to do, and it was a matter of regret, therefore, that some one of greater influence and ability had not been selected on the present occasion.

It was to be borne in mind that the cause of the vacancy in the Presidentship of the Society was the retirement of their respected and excellent friend Mr. Grote in consequence of a desire having been expressed by some members for a periodical change in the tenure of the office in accordance with the practice of learned Societies in Europe. In the desirability of introducing this principle into the Asiatic Society he fully concurred, and he would have been glad to see it carried out during the present year under ordinary circumstances, but when he reflected on the great difficulty there appeared to be in securing the services of a suitable person to fill the office, and when no better man than himself had been elected by the votes of the meeting, he submitted that at such a moment it was not good to introduce the change, and he heartily wished that their late President could have been prevailed on under such circumstances to forego his determination to

retire, and to consent to serve for another year, but as such had not unfortunately been the case, he (Lieutenant-Colonel Thuillier) had reluctantly yielded to the wish of those who had so kindly proposed, and voted for him.

For himself he would beg to assure the Society that, deeply sensible as he was of his own short-comings and unfitness for such a post, he could only endeavour by every means in his power to make up by perseverance and zeal, what he lacked in other respects, and he trusted with the co-operation and support of the Council, that when he laid down the tenure of his office at the end of the year, it might be found that the interests of the Society had not materially suffered. The meeting might depend on his using every exertion to maintain the prosperity and name of the Society.

It was now his duty to remind the meeting of the valuable services they had lost by the retirement of their late President, and to propose for their acceptance a resolution expressive of their regret at his secession and hearty thanks for the constant attention and devotion to the interests and business of the Society which Mr. Grote had, for the past four years rendered with so much advantage and, he believed, credit to the Society. Mr. Grote's services both in and out of that chair were well known to them all, but more particularly to the Council who had better opportunities of becoming acquainted with all he did here, as well as in his correspondence with scientific men and Societies in Europe, in the furtherance of the objects and interests of the Society. He was sure they all appreciated the good services of their late President, and he therefore had great pleasure in proposing a resolution embodying this feeling for record in their proceedings. It was a matter of congratulation that they were still to retain Mr. Grote as a Vice-President of the Society.

Colonel Thuillier then proposed the following resolution :—

That this meeting desire to record their deep sense of the valuable and unwearied services of Mr. Grote during the four years that he has served the office of President, and their great regret at his retirement from a post which he had occupied with so much advantage to the Society.

Bábú Rájendra Lál Mitra seconded the motion, which was then put and unanimously adopted.

The meeting then resolved itself into an ordinary general meeting.

The following presentations were announced :—

1. From Dr. Brockhaus, a complete set of *Die Lieder des Hafis, Persisch mit dem commentare des Sudi*.

2. From Lieutenant E. F. T. Fergusson, Superintendent Government Observatory, Bombay, a copy of the *Magnetical and Meteorological Observations in the year 1861*.

3. From Mr. John Allan Broun, Director of the Observatories of His Highness, the Rajah of Travancore, copies of his papers on the "Horizontal force of the Earth's Magnetism," "the Bifilar Magnetometer" and "the connection between meteorological phenomena and the variations of terrestrial Magnetism."

4. From the Royal Astronomical Society at Edinburgh, vols. 28, 29 and 30 of the *Memoirs of the Society*.

5. From the Superintendent of the Geological Survey of India, a copy of the *Memoirs of the Geological Survey of India, Palæontologia Indica, Part IV. 2nd series*.

6. From Bábú Joygopal Bysack, four copies of a collection of Persian odes written by him under the name of *گل*.

7. From Lieutenant-Colonel R. C. Tytler, an Andamanese earthen bowl.

8. From Mr. A. L. Agabeg, a box of shells.

9. From Mr. H. Cope, Umritsur, a silver coin from Ladakh.

10. From Bábú Shib Chunder Mullick, a trove of silver coins (of which two were exhibited at the September meeting) found in "Badi Kashee" Grant No. 211, Soonderbuns.

The following is a list of the coins by Mr. Bayley :—

Dated coins of Altumsh,	...	...	3
Ditto Behram,	...	...	2
Ditto Reziah,	...	...	2
Ditto Ghias-uddin,	...	...	4
Ditto Nasir-uddin,	...	...	3
Local Bengal coins,	...	...	4

Total, ... 18

The Council reported that they had given Mr. Blyth leave of absence for 12 months on full pay to enable him to proceed to Europe for the recovery of his health, and that they had paid him Rs. 1,000 in advance of his salary to provide for the expenses of his passage.

Mr. Oldham moved that this report be adopted.—*Agreed to.*

The Council also reported that they had appointed Bábú Poorno Chunder Bysack to officiate as curator of the zoological collections on probation on a salary of Rs. 100 per mensem.—*Adopted.*

The following gentlemen proposed at the last meeting were balloted for and duly elected ordinary members :—

F. Fedden, Esq., Geological Survey ; Hon'ble J. P. Norman, Hon'ble H. S. Maine, M. S. Howell, Esq., R. A. Sterndale, Esq., and J. Squire, Esq.,

Dr. T. Goldstücker, Professor of Sanscrit, London University, proposed by the Council at the last meeting was balloted for and elected a Corresponding Member.

The following gentlemen were named for ballot as ordinary members at the next meeting :—

E. T. Trevor, Esq., C. S. proposed by Mr. Grote, seconded by Mr. Atkinson.

The Hon'ble Rajah Deo Narain Singh, proposed by Captain W. N. Lees, seconded by Mr. Grote.

Communications were received—

1. From Bábú Gopinath Sein, abstracts of the results of the Hourly Meteorological Observations taken at the Surveyor General's Office in October last.

2. From Mr. W. T. Blanford, a paper entitled "Contributions to Indian Malacology, No. IV., Descriptions of new Land Shells from Ava and other parts of Burmah."

3. From Mr. W. Theobald, Jr., a paper entitled "Notes on the distribution of Indian Terrestrial Gasteropoda, considered with reference to its bearing on the origin of species."

ABSTRACT STATEMENT
OF
RECEIPTS AND DISBURSEMENTS
OF THE
ASIATIC SOCIETY,
FOR
THE YEAR 1862.

STATEMENT

Abstract of the Cash Accounts

RECEIPTS.

	1862.	1861.
ADMISSION FEES.		
Received from New Members, ...	1,600 0 0	1,600 0 0
		1,472 0 0
CONTRIBUTIONS.		
Received from Members, ...	7,222 9 0	7,222 9 0
		6,812 0 0
JOURNAL.		
Sale proceeds of, and Subscriptions to, the Journal of the Asiatic Society, ...	532 2 0	
Refund of Postage Stamps, ...	5 1 0	
		537 3 0
		553 15 0
LIBRARY.		
Sale proceeds of Books, ...	489 0 0	
Refund of Freight, ...	32 0 0	
		521 0 0
		385 8 0
MUSEUM.		
Received from the General Treasury, ...	5,200 0 0	
Savings of wages, ...	11 2 3	
		5,211 2 3
		3,629 5 0
SECRETARY'S OFFICE.		
Sale of Postage Stamps, ...	2 5 6	
Discount on ditto, ...	2 10 6	
Refund of Postage, ...	1 3 0	
		6 3 0
		11 2 0
VESTED FUND.		
Interest on Government Securities, received from the Bank of Bengal, ...	245 0 0	
		245 0 0
		245 0 0
COIN FUND.		
Sale proceeds of some gems taken by Mr. Theobald from Chandra Mull's batch of Coins, on account of Capt. Stubbs, ...	16 0 0	
		16 0 0
		118 11 9
ESTATE OF MACKINTOSH & Co.		
Received from the Assignee office, the 7th, 8th & 9th Dividends on a claim of Sicca Rupees 11,964-6-6,	50 11 9	
		50 11 9
DEPOSIT.		
E. C. Bayley, Esq. ...	13 0 0	
W. Theobald, Esq. ...	18 0 0	
M. Kempson, Esq. ...	12 0 0	
Carried over,	43 0 0	15,409 13 0

No. 1.

of the Asiatic Society for 1862.

DISBURSEMENTS.

	1862.	1861.
CONTRIBUTIONS.		
Returned to M. P. Edgeworth, Esq. for the year 1856 as he had been charged in error, ...	64 0 0	
		64 0 0 15 2 6
JOURNAL.		
Printing Charges, including paper, 1,963	6 0	
Freight, ...	118 1 0	
Purchasing Postage Stamps, ...	46 3 0	
Ditto Journals, ...	9 0 0	
Packing Charges, ...	11 8 0	
Engraving 4 Copper Plates, ...	96 0 0	
Ditto a Diagram, ...	2 0 0	
Ditto 24 Small Woodcuts, ...	6 0 0	
Drawing and Lithographing 484		
Copies of a Facsimile of an In-		
scription from Wardak, ...	7 3 0	
Ditto ditto Map of Burmah and		
Sketches of Buddhist Images, ...	260 0 0	
Ditto ditto on Stone 4 Plates of		
Skulls of Rhinoceros, ...	80 0 0	
Drawing 7 Plates of Tenasserim		
Coins, ...	40 0 0	
Ditto on Stone and Printing two		
plates of Celts in Journal No. III.		
of 1862, ...	58 8 0	
Ditto a map shewing advantages,		
obtainable by establishing com-		
munication across Krau, ...	15 0 0	
Ditto Route Survey from the Bay		
of Bengal to the Gulf of Siam,		
via the Isthmus of Krau, ...	10 0 0	
Ditto on Stone and Lithographing		
500 Copies of a Sanskrit Inscrip-		
tion from Central India, ...	105 0 0	
Lithographing on Transfer Paper		
facsimile of an Inscription from		
a Temple in Fort Gwalior, ...	25 0 0	
Ditto and Printing 4 Plates of		
Naogram Sculptures, ...	168 8 0	
Photographing Rubbing of an		
Inscription from Pagán, ...	30 0 0	
Printing 1900 Copies of Plates of		
Rhinoceros' Skulls, ...	57 0 0	
Commission on Sale of Books, ...	13 10 6	
Carried over,	3,121 15 6	64 0 0

RECEIPTS.

Brought over,	43	0	0	15,409	13	0	
D. F. Macleod, Esq. ...	18	0	0				
Major J. T. Walker, ...	24	0	0				
J. J. Grey, Esq. ...	0	8	0				
The Right Rev. the Lord Bishop of Calcutta, ...	36	0	0				
C. B. Saunders, Esq. ...	18	0	0				
Capt. M. Lloyd, ...	12	0	0				
E. G. Glazier, Esq. ...	12	0	0				
Baboo Nobin Chunder Roy, ...	4	0	0				
Lieut.-Col. J. Abbott, ...	19	7	0				
Naranjee Tricumjee, Esq. ...	1	14	0				
Baboo Brojendra Gopal Chowdry, ...	0	2	0				
C. A. Elliott, Esq. ...	2	9	6				
W. T. Dodsworth, Esq. ...	30	0	0				
	<hr/>			221	8	6	698 3 0
BALANCE OF 1861.							
Bank of Bengal,	2,212	10	11				
Cash in hand,	65	15	9				
				2,278	10	8	
Inefficient Balance, ...	...	182	15	0			
	<hr/>			2,461	9	8	

Carried over, 18,092 15 2

DISBURSEMENTS.

	Brought over,	3,121	15	6	64	0	0
Duty on a parcel of Lithographic							
Plates, ...		3	0	0			
Insufficient Postage,...		2	4	0			
Petty Charges, ...		1	11	6			
					3,128	15	0
					595	6	0

LIBRARY.

Salary of the Librarian for 12 months at Rs. 70 per month, .	840	0	0				
Establishment, ...	84	0	0				
Purchase of Books, ...	1,063	4	0				
Book Binding, ...	188	6	0				
Books Cleaning, ...	27	0	0				
Commission on sale of Books, .	45	7	6				
Printing 96 pages of 200 Copies of Catalogue of Mammalia, ...	192	0	0				
Paid Mr. E. Blyth, in part payment as a remuneration for preparing the Mammalia Catalogue of the Museum, ...	250	0	0				
Landing Charges, ...	1	10	0				
Petty Charges, ...	6	5	9				
				2,698	1	3	2,108
							7
							3

MUSEUM.

Salary of the Curator, E. Blyth, Esq. at Rs. 250 per month, for 12 months, ...	3,000	0	0				
His House-rent at Rs. 80 per month, for 12 months, ...	960	0	0				
Paid Income Tax on Mr. Blyth's Salary from Dec. 1861 to Nov. 1862, ...	120	0	0				
Establishment, ...	642	0	0				
Extra Taxidermists' Salary, ...	682	13	0				
Contingent Charges, ...	467	4	6				
Freight, ...	161	0	0				
Bearing Banghee Charges, ...	6	12	0				
Ticca Carpenter's wages, ...	52	5	6				
Paid Passage money for a Taxidermist accompanying Mr. E. Blyth to Mouhmein, ...	81	11	0				
Ditto Carriage hire on 3 Packages of Skins, ...	13	2	0				
Drawing on Transfer Paper Sketch to illustrate the Positions of places where the Goruckpore Aerolites fell, ...	5	0	0				
				6,192	0	0	6,333
							6
							3

SECRETARY'S OFFICE.

General Establishment, .	774	0	0				
Secretary's Office Establishment, .	873	0	0				
Purchase of Postage Stamps, .	60	9	0				
A Sheet Almanac for 1862, .	1	8	0				
Three Blank Books, ...	11	4	0				
				1,720	5	0	12,083
							0
							3

Carried over, 1,720 5 0 12,083 0 3

RECEIPTS.

Brought over, 18,092 15 2

Carried over, 18,092 15 2

DISBURSEMENTS.

	Brought over,	1,720	5	0	12,083	0	3
Printing Charges, ...	...	120	8	0			
Advertising Charges, ...	...	1	12	0			
Engraving a Seal for the Lever- embossing Press, ...	...	9	0	0			
Bearing Postage, ...	...	5	6	0			
Stationery, ...	...	105	11	0			
Petty Charges, ...	...	16	9	3			
					1,979	3	3
					1,840	11	9

VESTED FUND.

Paid Commission upon Interest on the Government Securities, ...	...	0	9	2			
Ditto Income Tax on ditto, ...	...	4	13	0			
					5	6	2
					10	3	6

COIN FUND.

Purchase of Coins, ...	...	68	0	0			
Ditto of 9 Assorted Gold Mohurs, ...	...	396	0	0			
Ditto of an Akbar ditto, ...	...	55	0	0			
A Teakwood Coin Cabinet, ...	...	35	4	0			
Fitting Pigeon holes in the wooden Coin Cabinet, ...	...	4	0	0			
Banghee Postage, ...	...	7	8	0			
Bearing ditto, ...	...	3	12	0			
2 Packets of Large Cards for labell- ing Coins, ...	...	1	8	0			
10 Paper Boxes for Coins, ...	...	0	10	0			
12 Bags for ditto, ...	...	0	10	0			
Petty Charges, ...	...	0	9	6			
					572	13	6
					191	8	0

BUILDING.

Assessment, ...	...	270	0	0			
Ditto for Lighting, ...	...	72	0	0			
Repairing, ...	...	13	0	6			
Metalling the Society's Compound, ...	...	25	0	0			
					380	0	6
					395	2	0

MISCELLANEOUS.

Advertising Charges, ...	...	22	14	0			
Meeting Charges, ...	...	167	5	6			
Wages of a Ticca Mally, ...	...	54	6	6			
A Bracket for the Clock, ...	...	6	2	0			
Purchase of Receipt Stamps, ...	...	7	9	0			
A Tin box for keeping the Kittoe Inscriptions, ...	...	5	4	0			
A Blank Book, ...	...	2	0	0			
Paid fee to the Bank of Bengal for Stamping Cheques, ...	...	3	2	0			
Petty Charges, ...	...	33	10	9			
					302	5	9
					521	15	0

Carried over, 15,322 13 5

RECEIPTS.

Brought over, Co.'s Rs. 18,092 15 2

Co.'s Rupees,... 18,092 15 2

Examined.

LALGOPAL DUTT,

*Assistant Secretary.**Asiatic Society's Rooms,
The 31st December, 1862.*

DISBURSEMENTS.

Brought over, 15,322 13 5

DEPOSIT.

E. Blyth, Esq. ...	...	360	0	0
Baboo Nobinchunder Roy, ...	...	0	14	0
E. C. Bayley, Esq. ...	...	13	0	0
Capt. H. G. Raverty, ...	...	26	12	0
Capt. E. L. Earle, ...	...	20	0	0
Major J. T. Walker, ...	...	24	0	0
Baboo Shumbhoo Chunder Roy, ...	...	12	0	0
R. H. M. Wafrand, Esq. ...	...	10	0	0
C. J. Campbell, Esq. ...	...	12	0	0
W. A. D. Anley, Esq. ...	...	18	0	0
M. Kempson, Esq. ...	...	12	0	0
W. Theobald, Esq. ...	...	18	0	0
D. T. Macleod, Esq. ...	...	18	0	0
W. T. Dodsworth, Esq. ...	...	18	0	0
The Right Rev. The Lord Bishop of Calcutta, ...	...	36	0	0
C. B. Saunders, Esq. ...	...	18	0	0
Capt. M. Lloyd, ...	...	12	0	0
E. G. Glazier, Esq. ...	...	12	0	0
Lieut.-Col. J. Abbott, ...	...	12	0	0
Rev. S. Hislop, ...	...	4	6	0

657 0 0 305 .

BALANCE.

Bank of Bengal, ...	757	8	9
Cash in hand, ...	78	5	6

835 14 3

Inefficient Balance, ...

1,277 3 6

2,113 1 9

Co.'s Rs.... 18,092 15 2

W. S. ATKINSON,
Secretary, Asiatic Society.

STATEMENT
Abstract of the Oriental

RECEIPTS.

	1862.	1861.
ORIENTAL PUBLICATIONS.		
Received by sale of Bibliotheca Indica, &c., ...	952 5 3	
Ditto by Subscription to ditto, ...	139 5 0	
Ditto by sale of White Yajur Veda, ...	98 0 0	
Refund of Postage Stamps, ...	3 11 0	
Discount on ditto, ...	0 3 9	
	<hr/>	
	1,193 9 0	877 12 9
GOVERNMENT ALLOWANCE.		
Received from the General Treasury at 500 Rs. per month, 12 months, ...	6,000 0 0	
	<hr/>	
	6,000 0 0	6,000 0 0
VESTED FUND.		
Received Interest on Government Securities from the Bank of Bengal, ...	440 0 0	
	<hr/>	
	440 0 0	440 0 0
CUSTODY OF ORIENTAL WORKS.		
Savings and Establishment, ...	17 0 9	
	<hr/>	
	17 0 9	6 6 3
BALANCE OF 1861.		
Bank of Bengal, ...	915 7 5	
Cash in hand, ...	44 2 5	
	959 9 10	
Inefficient Balance, ...	2,454 8 6	
	<hr/>	
	3,414 2 4	

Carried over, 11,064 12 1.

No. 2.

Fynd for the year 1862.

DISBURSEMENTS.

	1862.	1861.
ORIENTAL PUBLICATIONS.		
Commission on Sale of Books, ...	107 5 9	
Freight, ...	69 3 0	
Packing Charges, ...	21 9 0	
Purchase of Postage Stamps, ...	13 12 0	
Petty Charges, ...	9 2 0	
	<hr/>	
	220 15 9	175 10 9
VESTED FUND.		
Commission upon Interest on Government Securities, ...	1 1 9	
Income Tax on ditto, ...	8 12 0	
	<hr/>	
	9 13 9	18 8 11
CUSTODY OF ORIENTAL WORKS.		
Salary of Librarian at Rs. 30 per month, ...	360 0 0	
Establishment at Rs. 14 per month, ...	168 0 0	
Book Binding, ...	153 8 0	
Books Cleaning, ...	63 0 0	
Extra Writer's Salary, ...	4 0 0	
Banghee Expenses, ...	7 8 0	
Bearing Postage, ...	7 0 0	
Stamp fee paid to the Bank of Bengal, ...	1 9 0	
Packing Charges, ...	0 4 0	
Repairing the Library Cases, ...	4 4 0	
Printing Charges, ...	3 0 0	
Petty Charges, ...	1 0 0	
	<hr/>	
	773 1 0	864 1 0
LIBRARY.		
Purchase of Books and MSS., ...	114 9 9	
	<hr/>	
	114 9 9	94 8 0
DEPOSIT.		
Paid Dasia Santgram Swakaram, ...	41 13 0	
	<hr/>	
	41 13 0	
DICTIONARY OF TECHNICAL TERMS.		
Printing and Editing Charges, ...	484 0 0	
	<hr/>	
	484 0 0	1,844 0 0
TARIKH I FEROZSHAHI.		
Printing Charges, ...	100 0 0	
Copying and Examining, ...	0 12 0	
	<hr/>	
	100 12 0	1,344 2 0
	<hr/>	
	Carried over, 1,745 1 3	

RECEIPTS.

Brought over, 11,064 12 1

Carried over, 11,064 12 1

DISBURSEMENTS.

		Brought over,		1,745	1	3		
MARCANDEYA PURANA.								
Printing Charges, ...	...	277	8	0				
Charges for assistance in Editing,		100	0	0				
				<hr/>		377	8 0	817 8 0
SIDDHANTA SIROMANI TRANSLATION.								
Printing Charges, ...	...	194	8	0				
Drawing and Engraving 6 Diagrams, ...	...	20	0	0				
				<hr/>		214	8 0	401 0 0
WHITE YAJUR VEDA,								
Subscription to 20 Copies of Nos. 6 and 7 of vol. 3rd of ditto								
£21 @ 1-11½ per rupee, ...	...	214	7	6				
				<hr/>		214	7 6	
CHHANDOGYA UPANISHAD TRANSLATION.								
Printing Charges, ...	...	322	0	0				
Translating ditto, ...	...	183	8	0				
				<hr/>		505	8 0	
BLACK YAJUR VEDA.								
Editing Charges, ...		534	0	0				
				<hr/>		534	0 0	
KAMANDAKI.								
Editing Charges,		140	0	0				
				<hr/>		140	0 0	
NARADA PANCHARATRA.								
Printing Charges, ...		462	12	0				
Charges for assistance in Editing,		80	0	0				
				<hr/>		542	12 0	272 8 0
VEDANTA SUTRAS.								
Editing Charges,		460	0	0				
Printing ditto,		215	4	0				
				<hr/>		675	4 0	450 0 0
SA'NKHYA SA'RA.								
Copying Charges,		20	0	0				
				<hr/>		20	0 0	
DASARUPA.								
Printing Charges,		224	0	0				
				<hr/>		224	0 0	245 14 0
SANKARA DIGVIJAYA (Prose and Poetry.)								
Printing Charges, ...		110	8	0				
Purchase of Paper for ditto,		180	0	0				
				<hr/>		290	8 0	
SANHITA OF THE BLACK YAJUR VEDA.								
Printing Charges,		224	0	0				
				<hr/>		224	0 0	452 6 0
CONQUEST OF SYRIA.								
Printing Charges, ...		384	0	0				
				<hr/>		384	0 0	
		Carried over,		6,091	8	9		

RECEIPTS.

Brought over, 11,064 12 1

Co.'s Rs.,.... 11,064 12 1

Examined.

LALGOPAL DUTT,

*Assistant Secretary.**Asiatic Society's Rooms,**The 31st December, 1862.*

DISBURSEMENTS.

Brought over, 6,091 8 9

KAUSHITAKI BRAHMANA.

Printing Charges, ...	... 482 14 0	
	<u> </u>	482 14 0

NAKHBAT UL FIKR.

Editing and Printing Charges, ...	269	0	0	
	<u>269</u>	<u>0</u>	<u>0</u>	
				269 0 0

TARIKH I BAHAKI.

Printing and Editing Charges, ...	2,067	0	0			
	<u>2,067</u>	0	0	584	0	0

8,910 6 9'

BALANCE.

Bank of Bengal, ... 537 4 2

Cash in hand,	...	2	8	8
---------------	-----	---	---	---

539 12 10

Inefficient Balance,	1,614	8	6	2,154	5	4
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Co.'s Rs.... 11,064 12 1

W. S. ATKINSON,

Secretary, Asiatic Society.

STATEMENT, No. 3.

Shewing the Assets and Liabilities of the Asiatic Society at the close of 1862.

CASH.		1862.	1861.
Bank of Bengal,	Ra.	757 8 9	2,212 10 11
Cash in hand,		78 5 6	65 15 9
Inefficient Balance,		1,277 3 6	182 15 0
Government Securities,		5,000 0 0	5,000 0 0
		7,113 1 9	7,461 9 8
OUTSTANDINGS.			
Contributions,	Ra.	4,156 10 8	5,041 14 3
Admission Fees,		224 0 0	448 0 0
Library, Sale of Books,		291 8 0	302 8 0
Journal Subscription,		483 12 3	509 2 3
Ditto, Sale of,		63 12 3	24 4 0
Government Allowance for Dec., 1862,		500 0 0	300 0 0
		5,719 11 2	6,625 12 6
Examined			
ASIATIC SOCIETY'S ROC		LALGOPAL DUTT,	
The 31st Dec., 1862.		Assistant Secretary, Asiatic Society.	
Hon'ble Sir J. W. Colville, Kt., ... Rs.		1862.	
J. W. Laidlay, Esq.,		1861.	
Deposits,		276 8 0	276 8 0
Messrs. Williams and Norgate,		418 7 4	418 7 4
Salary, Establishment and Contingent		54 2 6	489 10 0
Charges for December, say,		607 2 4	356 0 0
Printing Journal, Nos. I. II. & III. of		600 0 0	700 0
1862,		1,060 8 0	1,716 8
Ditto Nos. IV. & V. for which no		650 0 0	0 0
account has yet been rendered, about,			
Subscription to the Oriental Translation			
Fund, £31-10s.		315 0 0	210 0
Bird Catalogue, (Binding),		42 4 0	42 4
Bengal Printing Company 200 Copies			
of Mammalia Catalogue in Press, say,		250 0 0	0 0
		4,274 0 2	4,209 5 4

W. S. ATKINSON,
Secretary, Asiatic Society.

STATEMENT, No. 4.

Shewing the Assets and Liabilities of the Oriental Publication Fund at the close of 1862.

ASSETS.		LIABILITIES.	
1862.	1861.	• 1862.	1861.
Government Securities, .....Rs.	9,500 0 0	Deposits, .....Rs.	146 13 0
In the Bank of Bengal,	537 4 2	Establishment and Contingencies for	188 10 0
Cash in hand,	2 8 8	Dec, 1862,	50 0 0
Inefficient Balance,	1,614 8 6	Editing Charges due for works not yet	50 0 0
Government Allowance for Dec., 1862,	500 0 0	complete, about	1,922 8 0
Bibliotheca Indica Sale and Subscription,	610 7 9	Printing Charges, say	3,000 0 0
			4,000 0 0
			3,261 4 0
</			

Examined,

LALGOPAL DUTT,

Assistant Secretary, Asiatic Society.

• W. S. ATKINSON,

Secretary, Asiatic Society.

ASIATIC SOCIETY'S ROOMS,

The 31st Dec., 1862.

LIST OF ORDINARY MEMBERS
OF THE
ASIATIC SOCIETY OF BENGAL

ON THE 31ST DECEMBER, 1862.

The * distinguishes Non-Subscribing and the † Non-Resident Members.

Date of Election.

June	2, 1847	†Abbott, Lieut.-Col. J., Artillery, Delhi.
Dec.	5, 1860	Abdool Lutceef, Khan Bahadur, Maulavi, Calcutta.
July	4, 1860	†Ahmed, Saiïd, Khan Bahadur, Ghazipore.
April	2, 1862	Aitchison, C. U., Esquire, B. C. S., Calcutta.
"	4, 1862	*Aitchison, J. E. T., Esquire, M. D., Europe.
Feb.	2, 1859	*Alabaster, C., Esquire, China.
July	7, 1852	*Allen, C., Esquire, B. C. S., Europe.
Oct.	3, 1860	Amir Ali, Khan, Munshi, Calcutta.
Sept.	4, 1843	*Anderson, Lieut.-Col. W., Bengal Artillery, Europe.
May	1, 1861	Anderson, T., Esquire, M. D., F. L. S., Royal Botanic Garden, Calcutta.
Nov.	7, 1860	†Anley, W. A. D., Esquire, Allahabad.
Oct.	8, 1862	Apurva Krishna, Rajah Bahadur, Calcutta.
	12, 1859	Archer, Dr. C., Calcutta.
Sept.	4, 1861	Asghur Ali, Khan Bahadur, Nawab, Calcutta.
July	3, 1861	*Asphar, J. J. T. H., Esquire, Europe.
"	4, 1855	Atkinson, W. S., Esquire, M. A., F. L. S., Calcutta.
March	7, 1860	Atkinson, Lieut.-Col. F. D., Calcutta.
Feb.	6, 1861	†Austen, Capt. H. G., H. M.'s 24th Foot, Surv. General's Dept., Dehra Dhoon.
Sept.	6, 1826	Avdall, J., Esquire, Calcutta.
Oct.	7, 1835	*Baker, Col. W. E., Bengal Engineers, Europe.
Nov.	7, 1860	Banerjea, Rev. K. M., Calcutta.
March	6, 1861	†Barnes, C. H., Esquire, Bhágálpore.
Augt.	6, 1862	†Basevi, Capt. J. P., Bengal Engineers, Vizagapatam.
Jan.	3, 1838	†Batten, J. H., Esquire, B. C. S., Myniporee.
July	4, 1860	†Batten, G. H. M., Esquire, B. C. S., Allahabad.
May	4, 1859	Bayley, E. C., Esquire, B. C. S., Calcutta.
Feb.	6, 1861	Bayley, S. C., Esquire, B. C. S., Calcutta.
June	6, 1849	Beadon, Hon'ble C., B. C. S., Calcutta.
April	7, 1841	Beaufort, F. L., Esquire, B. C. S., Calcutta.
Sept.	4, 1847	*Beavan, Lieut. R. C., late 62nd B. N. I., Europe.
Augt.	4, 1861	*Beckwith, J., Esquire, Europe.

Date of Election.

Sept. 1, 1830	*Benson, Lieut.-Col. R., Europe.
Dec. 8, 1862	Bernard, C. E., Esquire, Calcutta.
Augt. 6, 1862	†Beverley, H., Esquire, B. C. S., Monghyr.
June 4, 1862	†Bhau Daji, Dr., Bombay.
July 2, 1862	Bhola Náth Mullick, Bábu, Calcutta.
„ 15, 1840	*Birch, Major General Sir R. J. H., K. C. B., Europe.
March 4, 1846	*Blaggrave, Major T. C., 26th Regt. B. N. I., Europe.
Sept. 7, 1859	Blane, Lieut.-Col. S. J., Calcutta.
March 4, 1857	Blanford, H. F., Esquire, Calcutta.
Augt. 3, 1859	†Blanford, W. T., Esquire, Geological Survey, Bombay.
2, 1837	*Bogle, Lieut.-Col. Sir A., Europe.
3, 1859	Bolie Chand Singh, Bábu, Calcutta.
March 6, 1861	*Boulnois, C., Esquire, B. A., Europe.
Oct. 12, 1859	†Bowring, L. B., Esquire, B. C. S., Mysore.
Nov. 1, 1854	*Boycott, Dr. T. B., M. S., Europe.
April 4, 1860	Braddon, H., Esquire, Calcutta.
March 7, 1860	†Brandis, Dr. D., Rangoon.
Oct. 3, 1860	†Brandreth, J. E. L., Esquire, Rawal Pindee.
Jan. 15, 1862	†Briggs, Major D., Assam.
June 2, 1847	*Brodie, Capt. T., 5th Regt. B. N. I., Europe.
Feb. 6, 1861	Brown, J., Esquire, M. D., B. M. S., Calcutta.
Nov. 7, 1860	†Browne, Horace A., Capt., Rangoon.
March 7, 1860	Browne, Rev. J. Cave, M. A., Calcutta.
July 4, 1860	†Bunsput Sinha, Rajah, Allahabad.
April 3, 1861	Burn, Rev. T. H., M. A., Calcutta.
Sept. 3, 1856	Busheerooddeen, Sultan Mohammad, Chinsurah.
July 4, 1860	†Byrne, L. F., Esquire, C. E., Lahore.
April 6, 1859	Calcutta, Right Rev. Lord Bishop of, Calcutta.
Sept. 7, 1859	*Campbell, Dr. A., Europe.
June 6, 1860	*Campbell, C. J., Esquire, C. E., Europe.
Jan. 4, 1860	†Carnac, J. H. Rivett, Esquire, B. C. S., Nagpur.
Sept. 3, 1856	*Chapman, R. B., Esquire, B. C. S., Europe.
Oct. 3, 1860	†Christian, J., Esquire, Monghyr.
Sept. 4, 1861	†Cockburn, J. F., Esquire, C. E., Kurhurbari Colliery.
April 2, 1862	†Colles, J. A. P., Esquire, M. D., Umritsur.
March 5, 1851	*Colvin, J. H. B., Esquire, B. C. S., Europe.
Dec. 5, 1860	†Cooper, F. H., Esquire, B. C. S., Delhi.
March 4, 1857	Cowell, E. B., Esquire, M. A., Calcutta.
July 3, 1861	*Crockett, Oliver R., Esquire, China.
April 2, 1862	†Dalrymple, F. A. E., Esquire, C. S., Dacca.
June 2, 1847	†Dalton, Major E. T., 9th Regt. B. N. I., Chota Nagpur.
Nov. 6, 1861	†Davies, R. H., Esquire, B. C. S., Punjab.
Sept. 4, 1861	Davidson, Capt. E., Bengal Engineers, Calcutta.
March 6, 1861	†Davey, N. T., Esquire, Revenue Survey, Sylhet.
June 4, 1856	†DeBourbel, Major R., Bengal Engineers, Allahabad.

Date of Election.

Nov. 7, 1860	Digumber Mitra, Bábu, Calcutta.
June 5, 1861	†Denison, His Excellency Sir William, K. C. B., Madras.
March 6, 1861	*Devereux, Hon'ble H. B., B. C. S., Europe.
May 8, 1862	†Dhunpati Singh Dooghur, Bábu, Moorshedabad.
Sept. 7, 1853	*Dickens, Lieut.-Col. C. H., Europe.
Jan. 9, 1861	†Dodsworth, W. T., Esquire, Meerut.
Sept. 7, 1859	Douglas, Lieut.-Col. C., Calcutta.
July 5, 1854	Drummond, Hon'ble E., B. C. S., Calcutta.
Feb. 6, 1861	†Duhan, H., Esquire, G. T. Survey, Dehra Dhoon.
Jan. 4, 1860	†Duka, Dr. T., Monghyr.
May 1, 1861	†Earle, Capt. E. L., Bengal Artillery, Kurnal.
" 6, 1857	*Eatwell, Dr. W. C. B., Europe.
Oct. 7, 1840	*Edgeworth, M. P., Esquire, B. C. S., Europe.
May 4, 1859	†Edmonstone, Hon'ble G. F., B. C. S., Allahabad.
Jan. 7, 1846	*Elliott, Hon'ble Walter, M. C. S., Europe.
Nov. 2, 1859	†Elliott, C. A., Esquire, B. C. S., Agra.
March 5, 1856	*Ellis, Lieut.-Col. R. R. W., 23rd Regt. B. N. I., Europe.
Nov. 1, 1854	†Elphinstone, Capt. N. W., 4th Regt. B. N. I., Jul- lunder.
Jan. 9, 1861	Erskine, Hon'ble C. J., Bombay C. S., Calcutta.
Augt. 6, 1856	*Erskine, Major W. C., C. B., Europe.
" 6, 1862	Eyre, Col. Vincent, C. B., Calcutta.
May 7, 1851	Fayrer, Dr. J., B. M. S., Calcutta.
Oct. 12, 1859	Fisher, A., Esquire, Calcutta.
Augt. 1, 1860	†Fitzgerald, Major C. M., Umballah.
Oct. 12, 1859	†Fitzpatrick, D., Esquire, C. S., Umritsur.
March 7, 1860	FitzWilliam, Hon'ble W. S., Calcutta.
Oct. 12, 1859	Furlong, Capt. J. G. R., Calcutta.
Feb. 6, 1861	†Forrest, R., Esquire, Civil Engineers, Dehra Dhoon.
Jan. 4, 1860	†Fraser, Capt. A., Alguada Reef.
March 7, 1860	†Frere, His Excellency Sir H. Bartle, K. C. B., B. C. S., Bombay.
Sept. 4, 1861	†Fuller, Capt. A. R., Lahore.
Dec. 7, 1859	Futteh Ali, Maulavi, Calcutta.
Sept. 5, 1849	†Fyche, Lieut.-Col. A., 70th Regt. B. N. I., Maul- mein.
" 7, 1859	†Gardener, D. M., Esquire, B. C. S., Furruckabad.
Augt. 3, 1859	Gastrell, Lt.-Col. J. E., 13th Regt. N. I., Revenue Survey, Calcutta.
Sept. 7, 1859	Geoghegan, J., Esquire, B. C. S., Calcutta.
" 2, 1842	*Gladstone, W., Esquire, Europe.
April 2, 1862	†Glazier, E. G., Esquire, C. S., Dacca.
Sept. 7, 1859	Goodeve, E., Esquire, M. D., Calcutta.
Dec. 5, 1860	†Guru Churn Doss, Bábu, Berhampore.
Sept. 5, 1860	†Goss, W. Forbes, Esquire, Nya Doomkah, Beer- bhoon.

Date of Election.

July	2, 1862	Gordon, J. D., Esquire, B. C. S., Calcutta.
Feb.	5, 1862	†Gourdoss Bysack, Bábu, Berhampore.
Sept.	6, 1840	Govin Chunder Sen, Bábu, Calcutta.
Dec.	7, 1859	*Grant, Sir J. P., K. C. B., Europe.
July	4, 1860	Grant, J. P., Esquire, Jr., B. C. S., Calcutta.
Jan.	4, 1860	Grant, T. R., Esquire, Calcutta.
Augt.	2, 1854	Grapel, W., Esquire, M. A., Calcutta.
March	6, 1861	†Grey, J. J., Esquire, Maldah.
July	4, 1860	Grey, Hon'ble W., B. C. S., Calcutta.
Sept.	4, 1861	†Griffin, L., Esquire, B. C. S., Lahore.
Nov.	7, 1860	†Griffith, R. T. H., Esquire, Benares.
Augt.	1, 1849	Grote, A. Esquire, B. C. S., F. L. S., Calcutta.
Feb.	6, 1861	*Growse, F. S., Esquire, B. C. S., Europe.
"	5, 1862	†Guthrie, Col. C. S., Bengal Engineers, Ootakamond.
June	2, 1847	*Hall, F. E., Esquire, M. A., D. C. L., Europe.
May	2, 1860	Halleur, Dr. H., Calcutta.
March	7, 1855	*Hamilton, R., Esquire, China.
Nov.	12, 1828	*Hamilton, Sir R. N. E., Bart., B. C. S., Europe.
May	5, 1847	*Hannington, Col. J. C., 63rd Regt. N. I., Europe.
Oct.	12, 1859	*Hardie, Dr. G. K., Europe.
"	8, 1862	Harington, Hon'ble H. B., Calcutta.
"	3, 1860	†Harris, E. B., Esquire, Civil Surgeon, Monghyr.
Feb.	6, 1861	†Harrison, A. S., Esquire, B. A., Missouri.
Oct.	12, 1859	†Haughton, Major J. C., Assam.
May	3, 1848	*Hearsay, Major General Sir J. B., K. C. B., Europe.
Augt.	6, 1862	†Heeley, W. L., Esquire, B. C. S., Nuddea.
"	3, 1859	†Henessey, J. B. N., Esquire, Dehra Dhoon.
July	6, 1853	Herschel, W. J., Esquire, B. C. S., Calcutta.
March	1, 1854	*Hichens, Lieut. W., Bengal Engineers, Europe.
May	2, 1860	Hobhouse, C. P., Esquire, B. C. S., Calcutta.
Oct.	8, 1862	Hogg, C. S., Esquire, Calcutta.
Sept.	7, 1859	*Hopkinson, Major H., Europe.
March	7, 1860	†Hovenden, Major J. J., Bengal Engineers, Allahabad.
July	2, 1862	Hyde, Lieut.-Col. H., Royal Bengal Engineers, Calcutta.
Jan.	4, 1860	†Innes, Major J. J. M., Lahore.
Oct.	8, 1862	†Irwin, Valentine, Esquire, B. C. S., Dinajpore.
Dec.	7, 1853	†Ishureeprasad Singh, Bahadur, Rajah, Benares.
Jan.	9, 1861	Jackson, Hon'ble L. S., B. C. S., Calcutta.
April	7, 1841	*Jackson, W. B., Esquire, B. C. S., Europe.
"	2, 1851	Jadava Krishna Singh, Bábu, Calcutta.
Jan.	4, 1860	Jallaluddin, Mohammad, Prince, Calcutta.
July,	5, 1854	James, Major H. C., 32nd Regt. B. N. I., Calcutta.
Dec.	4, 1861	*James, Major H. R., C. B., Europe.
"	3, 1845	Jerdon, T. C., Esquire, M. M. S., Calcutta.
July	2, 1862	Johnson, Major A. B., Bengal Staff Corps, Calcutta.
June	2, 1847	*Johnstone, J., Esquire, Europe.

Date of Election.

March 5, 1862	†Johnstone, Lieut. J., Asst. Commissioner, Shahpore.
Sept. 7, 1859	*Jones, R., Esquire, Europe.
April 1, 1857	Joygopal Bysack, Bábu, Calcutta.
May 4, 1853	†Kabeerooddeen Ahmed, Huzrut Shah, Sasseram.
Feb. 3, 1858	Kaliprosonno Singh, Bábu, Calcutta.
March 2, 1859	Kasinath Roy Choudhury, Bábu, Cásipur, Calcutta.
April 3, 1850	Kay, Rev. W., D. D., Calcutta.
Dec. 4, 1861	†Kempson, M., Esquire, M. A., Bareilly.
Jan. 15, 1862	†King, W., Esquire, Jr., Geological Survey, Madras.
March 6, 1839	*Laidlay, J. W., Esquire, Europe.
„ 6, 1861	*Laing, Rt. Hon'ble S., Europe.
Dec. 3, 1851	*Layard, Major F. P., Europe.
April 7, 1852	Lees, Capt. W. N., LL. D., Calcutta.
Dec. 7, 1859	Leonard, II., Esquire, C. E., Calcutta.
Feb. 6, 1856	*Liebig, Dr. G. Von, B. M. S., Europe.
Jan. 4, 1860	Lindsay, E. J., Esquire, Calcutta.
Nov. 6, 1861	†Lloyd, Capt. M., Tounghoo.
Dec. 3, 1862	Lobb, S., Esquire, M. A., Calcutta.
Oct. 7, 1835	*Loch, G., Esquire, B. C. S., Europe.
July 2, 1828	*Low, Hon'ble Major General J., Europe.
April 3, 1861	†Lumsden, Major P. S., Murree.
Nov. 1, 1854	*Lushington, F. A., Esquire, B. C. S., Europe.
Dec. 5, 1860	Macfarlane, D. H., Esquire, Calcutta.
April 5, 1848	†Maclagan, Lieut.-Col. R., Lahore.
March 5, 1862	Macnamara, Dr. F. N., Calcutta.
April 6, 1853	Macrae, Dr. A. C., B. M. S., Calcutta.
Jan. 4, 1860	Mair, D. K., Esquire, M. A., Calcutta.
Sept. 3, 1862	Mallet, F. R., Esquire, Calcutta.
Nov. 3, 1852	Manickjee Rustomjee, Esquire, Calcutta.
June 5, 1861	†Mán Singh, Bahadur, Maharajah, Oude.
July 4, 1860	*Man, E. G., Esquire, Europe.
Jan. 2, 1850	*Marshman, J. C., Esquire, Europe.
Sept. 3, 1862	†Martin, R. L., Esquire, B. A., Dacca.
July 3, 1862	McCrindle, J. W., Esquire, M. A., Calcutta.
Oct. 4, 1837	†McLeod, D. F., Esquire, C. B., B. C. S., Lahore.
April 6, 1853	Medlicott, J. G., Esquire, B. A., Calcutta.
March 7, 1860	Medlicott, H. B., Esquire, F. G. S., Calcutta.
Feb. 6, 1861	†Melville, Capt. A. B., late 67th N. I., Surveyor General's Dept., Dehra Dhoon.
Nov. 7, 1855	*Middleton, J., Esquire, Europe.
April 3, 1850	*Mills, A. J. M., Esquire, B. C. S., Europe.
„ 7, 1847	*Money, D. I., Esquire, B. C. S., Europe.
„ 4, 1860	†Money, A., Esquire, B. C. S., Bhágalspore.
Feb. 6, 1856	Money, J. W. B., Esquire, Calcutta.
July 2, 1862	Monteath, A. M., Esquire, B. C. S., Calcutta.
Feb. 1, 1860	†Montgomerie, Capt. T. G., B. E., F. R. G. S., Trigonometrical Survey, Dehra Dhoon.
Dec. 6, 1854	*Morris, G. G., Esquire, B. C. S., Europe.

Date of Election.

- Oct. 11, 1854 *Muir, W., Esquire, B. C. S., Europe.
 July 5, 1837 *Muir, J., Esquire, Europe.
 Augt. 3, 1859 †Murray, Lieut. W. G., 68th N. I., Rewah.
 July 2, 1862 Napier, Hon'ble Major General Sir R., K. C. B., Calcutta.
 Augt. 3, 1859 †Narendra Narain Bhupa, Maharajah, Coch Behar.
 Nov. 7, 1860 †Newmarch, Major C. D., Pegu.
 Sept. 1, 1852 *Nicholls, Capt. W. T., 24th Regt. M. N. I., Europe.
 April 2, 1862 Norman, Lieut.-Col. H. W., C. B., Calcutta.
 Aug. 3, 1859 Obbard, J., Esquire, Calcutta.
 Jan. 4, 1860 †Oldham, C., Esquire, Geological Survey, Madras.
 June 4, 1851 Oldham, T., Esquire, L.L.D., F.R.S., F.G.S., Calcutta.
 „ 7, 1837 *O'Shaughnessy, Sir W. B., Europe.
 Feb. 10, 1847 *Ouseley, Major W. R., Europe.
 May 7, 1862 Partridge, S. B., Esquire, M. D., Calcutta.
 Feb. 1, 1860 †Pearse, Major G. G., Madras.
 June 5, 1861 †Pelly, Capt. L., Bombay Army, Zanzibar.
 July 1, 1835 †Phayre, Lieut.-Col. A., Rangoon.
 Oct. 8, 1862 †Poolin Behary Sein, Bábu, Berhampore.
 Sept. 5, 1849 Pratáp Chandra Sinhá, Rajah, Bahadur, Calcutta.
 March 6, 1839 Pratt, Ven'ble Archdeacon J. H., M. A., Calcutta.
 Jan. 4, 1860 Preonath Sett, Bábu, Calcutta.
 March 9, 1825 *Prinsep, C. R., Esquire, Europe.
 Feb. 1, 1837 Prosonno Coomar Tagore, Bábu, Calcutta.
 April 2, 1862 †Raban, Major H., Chera Poonjee.
 „ 2, 1862 †Rajkissen Roy, Bábu, Berhampore.
 „ 6, 1853 Radha Nath Sikdar, Bábu, Chandernagore.
 Sept. 5, 1849 Rajendra Dutt, Bábu, Calcutta.
 March 5, 1856 Rajendralála Mitra, Bábu, Calcutta.
 Feb. 1, 1837 Ramánath Tagore, Bábu, Calcutta.
 Augt. 5, 1840 Rangopal Ghose, Bábu, Calcutta.
 March 7, 1860 *Reid, H. S., Esquire, Europe.
 June 7, 1854 *Riddell, H. B., Esquire, B. C. S., Europe.
 Nov. 7, 1860 †Riley, E. O., Esquire, F. G. S., Bassein.
 Augt. 6, 1856 Roberts, Hon'ble A., B. C. S., Calcutta.
 March 5, 1862 †Robinson, Capt. D. G., Bengal Engineers, Dehra Dhoon.
 Augt. 3, 1853 *Röer, Dr. E., Europe.
 Dec. 1, 1847 *Rogers, Capt. T. E., Europe.
 Sept. 7, 1859 †Russell, A. E., Esquire, B. C. S., Berhampore.
 Feb. 6, 1856 †Russell, R. H., Esquire, B. C. S., Midnapore.
 July 4, 1860 *Sampson, A. B., Esquire, B. A., Europe.
 Nov. 2, 1859 †Sanders, J., Esquire, Calcutta.
 Dec. 4, 1861 †Sanders, C. B., Esquire, B. C. S., Mysore.
 „ 6, 1854 †Saxton, Capt. J. H., 38th M. N. I., Cuttack.
 May 2, 1854 *Schiller, F., Esquire, Europe.
 Feb. 1, 1860 *Scott, Col. E. W. S., Europe.
 Augt. 3, 1859 †Scott, W. H., Esquire, Dehra Dhoon.

Date of Election.

- July 4, 1860 †Shelverton, G., Esquire, Dehra Dhoon.
 Jan. 14, 1845 *Sherwill, Lieut.-Col. W. S., 66th Regt. B. N. I.,
 F. G. S., F. R. G. S., Europe.
 Sept. 7, 1859 †Sherwill, Major J. L., Manbhoom.
 „ 4, 1861 †Shumbhoo Chunder Roy, Bábu, Rungpur.
 July 4, 1860 Simpson, Dr. B., Calcutta.
 Feb. 6, 1856 *Smith, Col. J. F., Europe.
 March 2, 1859 *Smith, H. Scott, Esquire, B. A., Europe.
 Feb. 5, 1862 †Smyth, Capt. E., Almorah.
 Sept. 6, 1854 †Spankie, R., Esquire, B. C. S., Meerut.
 March 2, 1859 Stainforth, H., Esquire, Calcutta.
 May 2, 1860 Stanton, Major F. S., Bengal Engineers, Europe.
 Sept. 4, 1843 *Stephen, Major J. G., 8th N. I., Europe.
 Oct. 8, 1862 Stevens, C. C., Esquire, B. C. S., Dum Dum.
 Sept. 4, 1861 Stewart, Major P., Bengal Engineers, Europe.
 Feb. 6, 1861 †Stewart, Lieut. W. J., Bengal Artillery R. Survey,
 Burrisal.
 June 7, 1848 Strachey, J., Esquire, B. C. S., Calcutta.
 May 3, 1843 Strachey, Lieut.-Col. R., F. R. S., F. L. S., F. G. S.,
 Calcutta.
 March 2, 1859 †Stubbs, Capt. F. W., Bengal Artillery, Mean
 Meer.
 Oct. 2, 1861 †Sudderooddeen, Moonshi, Pundooah.
 July 7, 1858 †Sutherland, H. C., Esquire, B. C. S., Rajshahye.
 Feb. 2, 1859 †Suttischunder Roy, Maharajah, Krishnagar.
 Augt. 6, 1856 Satyasharana Ghosal, Rajah, Bhokylas, Calcutta.
 May 2, 1860 †Temple, R., Esquire, B. C. S., Nagpur.
 March 2, 1859 †Theobald, W., Esquire, Jr., Geological Survey, Ran-
 goon.
 June 6, 1860 Thompson, J. G., Esquire, Calcutta.
 „ 6, 1855 *Thomson, Dr. T., M. D., F. R. S., F. L. S., F. R. G. S.,
 Europe.
 Jan. 4, 1860 Thompson, Rev. J. C., Calcutta.
 Nov. 21, 1853 †Thornhill, C. B., Esquire, B. C. S., Allahabad.
 June 2, 1847 Thuillier, Lieut.-Col. H. L., F. R. G. S., Bengal
 Artillery, Calcutta.
 July 2, 1862 Thurlow, Hon'ble T. J. H., Calcutta.
 Nov. 2, 1859 †Tickell, Major S. R., Moulmein.
 Feb. 5, 1862 †Torrens, Col. H. D., Simlah.
 June 5, 1861 †Tremlett, J. D., Esquire, B. C. S., Jullunder.
 Feb. 3, 1841 Trevor, Hon'ble C. B., B. C. S., Calcutta.
 March 7, 1860 Turnbull, Lieut.-Col. A. D., Roorkee.
 Sept. 4, 1861 Tween, A., Esquire, Geological Survey, Calcutta.
 May 2, 1860 †Vanrenen, Capt. A. D., late 71st B. N. I., R. Sur-
 vey, Landour.
 Oct. 2, 1861 Walagohur, Mohammad Saheb-zadah, Calcutta.
 May 1, 1861 †Walker, Major J. T., Bombay Engineers, Madras.
 Jan. 15, 1862 Ward, G. E., Esquire, Calcutta.

Date of Election.

July 7, 1852	*Ward, J. J., Esquire, B. C. S., Europe.
" 6, 1859	†Warrand, R. H. M., Esquire, B. C. S., Muttra.
" 5, 1854	*Watson, J., Esquire, B. C. S., Europe.
March 7, 1860	Wauchope, S., Esquire, C. B., B. C. S., Calcutta.
Nov. 3, 1847	*Waugh, Major-Gen. Sir A. S., C. B., F. R. S., F. R. G. S., Europe.
April 6, 1859	Wells, Hon'ble Sir Mordaunt, Kt., Calcutta.
Oct. 8, 1862	Wheeler, J. T., Esquire, Calcutta.
Sept. 4, 1861	†Williams, Dr. C., H. M.'s 68th Regt., Thayet Myo.
Augt. 3, 1859	†Wilmot, C. W., Esquire, Nya Doomka.
Oct. 8, 1862	Wilson, R. H., Esquire, Dum Dum.
Sept 7, 1859	†Wilson, W. L., Esquire, Beerbhoom.
May 7, 1851	Woodrow, H., Esquire, M. A., Calcutta.
March 2, 1859	*Wortley, Major A. H. P., Europe.
Augt. 6, 1862	Yyllie, J. W. S., Esquire, Bombay C. S., Calcutta.
April 4, 1855	*Young, Lieut.-Col. C. B., Europe.
July 2, 1856	*Yule, Lieut.-Col. H., Europe.

LIST OF HONORARY MEMBERS.

March 9, 1825	M. Garcin de Tassy, Membre de l' Institut., Paris.
" 1, 1826	Sir John Phillippart, London.
July 1, 1829	Count De Noe, Paris.
Sept. 7, 1831	Prof. Francis Bopp, Memb. de l' Academie de Berlin.
" 7, 1831	Prof. C. Lassen, Bonn.
Nov. 5, 1834	Sir J. F. W. Herschel, F. R. S., London.
" 5, 1834	Col. W. H. Sykes, F. R. S., London.
May 6, 1835	Prof. Lea, Philadelphia.
March 4, 1840	M. Reinaud, Memb. de l' Institut., Prof. de l' Arabe, Paris.
Feb. 4, 1842	Dr. Ewald, Gottingen.
" 4, 1842	Right Hon'ble Sir Edward Ryan, Kt., London.
March 30, 1843	Prof. Jules Mohl, Memb. de l' Institut., Paris.
May 5, 1847	His Highness Hekekyan Bey, Egypt.
Sept. 1, 1847	Col. W. Munro, London.
Nov. 3, 1847	His Highness the Nawab Nazim of Bengal, Moorshedabad.
Feb. 2, 1848	Dr. J. D. Hooker, R. N., F. R. S., London.
March 8, 1848	Prof. Henry, Princeton, United States.
April 6, 1853	Major-Gen. Sir H. C. Rawlinson, K. C. B., F. R. S., D. C. L., London.
Augt. 2, 1854	Col. Sir Proby T. Cautley, K. C. B., F. R. S., London.
March 7, 1855	Rájá Rádhákánta Deva, Báhádur, Calcutta.
July 6, 1858	B. H. Hodgson, Esquire, Europe.
" 6, 1858	Dr. H. Falconer, F. R. S., B. M. S., Europe.
March 2, 1859	Hon'ble Sir J. W. Colville, Kt., Europe.
" 7, 1860	Prof. Máx Muller, Oxford.

Date of Election.

Nov. 7, 1860	Mons. Stanislas Julien, Paris.
" 7, 1860	Col. Sir George Everest, Kt., F. R. S., London.
" 7, 1860	Dr. Robert Wight, London.
" 7, 1860	Edward Thomas, Esquire, London.
" 7, 1860	Dr. Aloys Sprenger, Germany.
" 7, 1860	Dr. Albrecht Weber, Berlin.

. LIST OF CORRESPONDING MEMBERS.

Oct. 2, 1844	MacGowan, Dr. J., Europe.
June 4, 1856	Kremer, Mons. A. Von, Alexandria.
" 4, 1856	Porter, Rev. J., Damascus.
" 4, 1856	Schlagintweit, Herr H., Berlin.
" 4, 1856	Smith, Dr. E., Beyrout.
" 4, 1856	Tailor, J., Esquire, Bussorah.
" 4, 1856	Wilson, Dr., Bombay.
March 4, 1857	Nietner, J., Esquire, Colombo, Ceylon.
" 3, 1858	Schlagintweit, Herr R., Berlin.
Nov. 2, 1859	Frederick, Dr. H., Batavia.
May 4, 1859	Bleeker, Dr. P., Batavia.
Feb. 1, 1860	Baker, Rev. H., Alipi, East Malabar.
" 1, 1860	Swinhoe, R., Esquire, Consulate, Amoy.
April 4, 1860	Haug, Dr. M., Poonah.
July 3, 1861	Gosche, Dr. R., Berlin.
March 5, 1862	Murray, A., Esquire, London.

LIST OF ASSOCIATE MEMBERS.

Oct. 7, 1835	Stephenson, J., Esquire, Europe.
Feb. 7, 1838	Keramut Ali, Saiëd, Hooghly.
Dec. 6, 1843	Long, Rev. J., Europe.
Jan. 14, 1845	Blyth, E., Esquire, Europe.

ELECTIONS IN 1862.

Ordinary Members.

Major D. Briggs, Assam.

W. King, Esquire, Jr., Geological Survey, Calcutta.

G. E. Ward, Esquire, Calcutta.

Col. C. S. Guthrie, Bengal Engineers, Otakamond.

Col. H. D. Torrens, Simla.

Bábu Gour Doss Bysack, Calcutta.

Capt E. Smyth, Almorah.

*Lieut. J. Johnstone, Assistant Commissioner, Shahpore.

Capt. D. G. Robinson, Bengal Engineers, Dehra Dhoon.

Dr. F. N. Macnamara, Calcutta.

C. U. Aitchison, Esquire, B. C. S., Calcutta.

Lieut.-Col. H. W. Norman, C. B., Calcutta.

F. A. E. Dalrymple, Esquire, Dacca.

E. G. Glazier, Esquire, B. C. S., Dacca.

J. A. P. Colles, Esquire, M. D., Umritsur.

Major H. Raban, Patna.

Bábu Rajkissen Roy, Berhampore.

Bábu Dhunpat Singh Dooghur, Berhampore.

S. B. Partridge, Esquire, M. D., Calcutta.

Dr. Bhau Daji, Bombay.

Hon'ble T. J. H. Thurlow, Calcutta.

J. D. Gordon, Esquire, B. C. S., Calcutta.

A. M. Monteath, Esquire, B. C. S., Calcutta.

Major A. B. Johnson, Bengal Staff Corps, Calcutta.

Hon'ble, Major General Sir R. Napier, K. C. B., Calcutta.

Bábu Bhola Nauth Mullick, Calcutta.

Lieut.-Col. H. Hyde, Royal Bengal Engineers, Calcutta.

Capt. J. P. Basevi, Vizagapatam.

H. Beverley, Esquire, B. C. S., Monghyr.

Col. Vincent Eyre, C. B., Calcutta.

W. L. Heeley, Esquire, B. C. S., Nuddea.

J. W. S. Wyllie, Esquire, B. C. S., Calcutta.

F. R. Mallet, Esquire, Calcutta.

R. L. Martin, Esquire, B. A., Dacca.

Rajah Apurva Krishna, Calcutta.

C. E. Bernard, Esquire, Calcutta.

C. S. Hogg, Esquire, Calcutta.

Hon'ble H. B. Harington, B. C. S. Calcutta.

Valentine Irwin, Esquire, B. C. S. Dinajpur.

Bábu Poolin Behary Sen, Berhampore.

C. C. Stevens, Esquire, B. C. S., Dum Dum.

R. H. Wilson, Esquire, Dum Dum.

J. T. Wheeler, Esquire, Calcutta.

S. Lobb, Esquire, M. A., Presidency College, Calcutta.

Corresponding Member.

A. Murray, Esquire, London.

LOSS OF MEMBERS DURING THE YEAR 1862.

By retirement.

Bábu Nundolal Bose, Calcutta.

Capt. W. A. Ross, Cawnpore.

H. Bell, Esquire, B. C. S., Jessore.

Rev. F. F. Mazuchelli, D.D., Calcutta.

Capt. De la Chaumette, Calcutta.

By death.

Hon'ble W. Ritchie, Calcutta.

Rajah Prasanno Nath Roy Bahadur, Degaputti, Rajshahye.

E. A. Blundell, Esquire, Singapore.

Bábu Jogindra Narain Roy, Rajshahye.

Bábu Ramáprasád Roy, Calcutta.

T. E. B. Judge, Esquire, Calcutta.

Dr. W. Crozier, Calcutta.

FOR FEBRUARY, 1863.

The monthly General Meeting of the Asiatic Society was held on the 4th instant.

Lieutenant-Colonel H. L. Thuillier, President, in the chair.

Presentations were received—

1. From the Government of India, Foreign Department, two copies of a series of twenty-eight Photographs illustrating the tribes of the Nagpore province, taken by Lieut. W. W. Hooper, of the seventh Madras Light Cavalry.

2. From Dr. Bhau Daji, a copy of the *Ramayana*, printed by Ganopoti Krishna, Bombay.

3. From Bábu Rájendra Mullick, two Ostrich eggs and a couple of Emu eggs and a specimen of the red-headed Crane.

4. From A. Grote, Esq., a young Kangaroo in spirit.

Read a letter from J. T. Wheeler, Esq., Asst. Secy. to the Government of India, Foreign Department, forwarding the following communication from the Political Agent at Nimar, reporting the particulars of an earthquake in that province and the Burwani territory, on the night of the 18th November last.

FROM CAPTAIN J. C. WOOD, *Political Agent in Nimar.*

TO MAJOR R. J. MEADE, *Agent, Govr.-Genl. for Central India.*

Dated, Camp Boorhanpoor, 26th, Dec., 1862.

SIR,—I have the honor to inform you, that on the night of the 18th ultimo at about 7½ o'clock, a shock of an earthquake was felt almost throughout Nimar and throughout the Burwani territory, accompanied with a very loud noise resembling the tramping of a multitude of horses.

2. The direction was from North-west to the South-east.

3. The shock was more severe in the Burwani country than elsewhere. Portions of walls fell down in some cases, and tiles were knocked off in other instances.

4. The shock was felt simultaneously from Burwani West to Poonassa East, South of the Nerbudda; and from Manupoor West to Burwani East, North of the Nerbudda.

5. These phenomena were not noticeable South of the Satporea

range at Boorhanpoor, nor in the Zainabad Purgunnah South of the Taptee.

6. The weather was very sultry at the time, and rain fell every where in Nimar a day or two after the shock of the earthquake was felt.

7. Shocks of earthquakes are very rarely felt in Nimar.

I have, &c.,

(Sd.) J. C. Wood,

Political Agent.

Letters from W. Grapel, Esq., and Bábú Rajkissen Roy, expressing their desire to withdraw from the Society were recorded.

The following gentlemen duly proposed at the last meeting were balloted for and elected ordinary members :—

E. T. Trevor, Esq., C. S., and the Hon'ble Raja Deo Narain Singh.

The following gentlemen were named for ballot as ordinary members at the next meeting :—

The Rt. Hon'ble Sir Charles Trevelyan, K. C. B., proposed by Lieutenant-Colonel R. Strachey and seconded by Mr. Atkinson.

The Hon'ble A. Eden, proposed by Mr. Medlicott and seconded by Mr. T. Oldham.

Bábú Hari Doss Dutt, proposed by Bábú Rájendralál Mitra and seconded by Mr. Grote.

Captain G. Hunter Thompson, Bengal Staff Corps, Revenue Survey Department, proposed by the President and seconded by Major J. E. Gastrell.

H. M. Rogers, Esq., C. S., proposed by Captain W. N. Lees and seconded by the President.

The Council reported that they had appointed the following Sub-Committees for 1863 :—

Finance.—Dr. J. Fayrer ; Bábú Rájendralál Mitra.

Philology.—Captain W. N. Lees ; Bábú Rájendralál Mitra ; E. C. Bayley, Esq. ; Hon'ble C. J. Erskine ; R. T. H. Griffith, Esq. ; and A. Grote, Esq.

Library.—Bábú Rájendralál Mitra ; Captain W. N. Lees ; Dr. J. Fayrer ; Dr. T. Anderson ; and T. Oldham, Esq.

Natural History.—T. Oldham, Esq. ; Dr. T. Anderson ; Dr. A. C. Macrae ; Dr. J. Fayrer ; A. Grote, Esq. ; H. F. Blanford, Esq. ; and Dr. T. C. Jerdon.

Meteorology and Physical Science.—The Ven'ble J. H. Pratt; T. Oldham, Esq.; Lieutenant-Colonel R. Strachey; Major J. T. Walker; Captain T. G. Montgomerie; J. Obbard, Esq.; and Major J. E. Gastrell.

Coin Committee.—Captain W. N. Lees; E. C. Bayley, Esq; Bábá Rájendralál Mitra; and A. Grote, Esq.

Committee of Papers.—E. C. Bayley, Esq., and A. Grote, Esq.

In submitting the above list of the Committees for the approval of the meeting, the President stated that it was the object of the Council to make each department as complete and efficient as possible by the addition of the names of members of the Society not in the Council, whether resident in Calcutta or otherwise, for the advice and assistance of gentlemen at a distance could be obtained at all times, and might prove especially useful. He therefore begged that if any member could suggest the names of any other gentlemen likely to take an interest in and further the important objects of the various sections, they would be good enough to do so, in order that the Council might have the benefit of their services.

No other names being proposed the lists were declared closed and accepted.

The President brought to the notice of the meeting that the Council had resolved to establish suitable albums for the collection of photographs of the Archaeological remains with which the country abounds, as well as for ethnological subjects, including the series which had been presented to the Society by the Government, and which were now being taken in various parts of India. A record of these valuable representations which photography was now so actively employed in perpetuating, he thought would be peculiarly appropriate and useful to the Society, and when once a start was made, it might be hoped, that many members would be able and willing to aid the collection, so as eventually to produce a most valuable and interesting work of reference. He therefore trusted members would be kind enough to bear the subject in remembrance, and favour the Society with their contributions from time to time. It was likewise proposed to have a portrait album of Members of the Society.

Communications were received—

1. From E. O. Riley, Esq., a paper entitled Remarks on the Lake of clear water in the District of Bassein, British Burmah.

2. From Captain E. C. S. Williams, Under-Secretary to the Government of India, Public Works Department, copy of a report by Major General Cunningham, Archæological Surveyor, on his researches up to March last, and a statement of his operations during last November.

3. From Bábu Gopinath Sein, abstracts of the results of the Hourly Meteorological observations taken at the Surveyor General's Office in November last.

The President then called on Mr. H. F. Blanford to read a paper on the Distribution of the land Gasteropoda of India and Burmah, by Mr. W. Theobald, Junior, of the Geological Survey, who was absent on duty.

The author commenced by expressing his dissent from Mr. Darwin's theory, and from certain views communicated in a paper by the Messrs. Blanford as to the mode of distribution of the Mollusca faunas of the isolated hill groups of Southern India. The observed fact having been that there is a remarkable similarity and in many cases identity between the land shells of the Nilgerries, Puchaniallies, Shevaroyes, &c. while those of the intervening plains are very different; it had been suggested that at a former period, when (as indicated by geological investigation) a large part of India was submerged beneath the sea, an interchange of species had taken place between the hill groups in question by floating timber, &c., or else that these species had emigrated across the plains when partially up-heaved and covered with a damp forest such as is requisite for the existence of these Mollusca. Mr. Theobald demurred to these views, on the ground that the transport of shells on floating timber must be so rare an occurrence as to be inapplicable to the case, and that there is no migratory instinct in snails similar to that of birds to impel them to extend their area of habitat as suggested. On the contrary, Mr. Theobald held that species were of sporadic origin, instancing in support of this view, the acknowledged ethnic centres of the human race. Moreover, he held, in opposition to Mr. Darwin, that species were incapable of variation to an unlimited extent. He pointed out that the land Mollusca of India were, as a rule, confined to definite provinces and at the conclusion of his paper gave a list of those provinces and of the land Mollusca peculiar to each.

Mr. H. F. Blanford in reply to Mr. Theobald's remarks, pointed out

to the meeting that the theory of specific centres, or in other words, the restriction of species as a rule to definite areas was the only assumption made by Messrs. Blanford in their paper, and so far from being disproved by Mr. Theobald it had been actually strengthened by his division of India into provinces, each of which had its peculiar Mollusca. That species were thus restricted as a rule was admitted by naturalists, almost without exception, and it was on this ground that the Messrs. Blanford had sought to explain the observed exception in the case of the hill faunas of Southern India. Carriage of Mollusca on floating wood was admitted to be exceptional and rare, but cases of the kind had been observed and experiments made which proved its possibility. It is true that no migratory instinct is known in snails, but, given increase of numbers and power of locomotion, and an extension of species over an increased area would necessarily follow until restrained by adverse conditions. As to the ethnic centres of the human race, it was observed that because, as argued, the sub-divisions of a species had sprung from definite centres, there was no reason to infer that the progenitors of these sub-divisions had not likewise sprung from a common centre. The sporadic origin of species is not held by any eminent naturalists of the present day, and Mr. Theobald had advanced no instance in its favour. Mr. Blanford further denied that there was any evidence of the limitation of variability in species, and pointing out that Mr. Theobald had advanced no arguments in support of his own view, gave instances to prove, that variation is known to such an extent that the variety is no longer capable of interbreeding with the parent stock : moreover, that many of our domestic varieties of animals and plants have become so much altered that the parent stock is either unknown or can only be indicated with doubt.

Mr. Blanford concurred generally with Mr. Theobald's division of India into sub-provinces, but would make some alterations therein.

The President proposed that the thanks of the meeting should be given to Mr. Theobald for his interesting paper, which would appear in the Journal in the usual course. The Society were especially indebted to the gentlemen of the Geological Survey of India, who, in the course of their travels and researches over the length and breadth of this country found so many opportunities of sending papers to the Society.

The President said he had much pleasure in introducing to the meeting a member from the Sister Presidency, Dr. Bhau Daji, of Bombay, of whom they had doubtless heard, as an eminent philologist. He was glad to find that the Doctor was prepared to make some remarks to the meeting, which no doubt would prove acceptable.

Dr. Bhau Daji then read an abstract of a paper which he had previously read before the Bombay Branch of the Royal Asiatic Society on the value of the numerical symbols in ancient Hindoo inscriptions. He had been enabled to ascertain their correct value from finding certain inscriptions, especially those at Nassick, where the symbols occurred with their value at the same time given in words. Dr. Bhau Daji also added some remarks on the era of Salivahan, which he would identify with the era of Kshaharata or Phrahates, one of the Arsacidæ. In the same way it seemed to him not improbable that the era of Vikramaditya was introduced by the Buddhists or Jains, and that it corresponds to the victory obtained by the Parthians over Crassus, B. C. 53. He concluded with presenting to the Society copies of his transcripts and translations of the Junagur and Adjunta inscriptions.

The thanks of the meeting were voted to Dr. Bhau Daji for his valuable communication, and the transcripts presented by him.

The President offered to produce *fac-similes* of the inscriptions on a reduced scale by the photo-lithographic process, which, although in its infancy here, was peculiarly adapted for such purposes. He expressed a hope also that Dr. Bhau Daji in the course of his travels in the N. W. Provinces and Kashmir, whither he was now going, would be able to transmit to the Society some of the fruits of his researches, which it would give the Council great pleasure to receive.

The Librarian then submitted his report.

LIBRARY.

The following are the accessions to the Library since the meeting held in November last.

Presented.

Brockhaus' die Lieder des Hafis Persisch mit dem commentare des Sudi Vols. I. to III.—BY THE AUTHOR.

Bombay Magnetical and Meteorological Observations for 1861.—BY THE BOMBAY GOVERNMENT.

On the Horizontal Force of the Earth's Magnetism. By J. A. Broun, Esq.
—BY THE AUTHOR.

The Bifilar Magnetometer.—BY THE SAME.

De la connexion entre les phénomènes météorologiques et les variations du
Magnétisme Terrestre.—BY THE SAME.

Memoirs of the Royal Astronomical Society, Vols. XXVIII. to XXX.
—BY THE ROYAL ASTRONOMICAL SOCIETY.

Memoirs of the Geological Survey of India, Palæontologia Indica, Vol. 2.,
Part IV.—BY THE SUPERINTENDENT GEOLOGICAL SURVEY OF INDIA.

Ditto ditto.—BY THE GOVERNMENT OF INDIA.

Ditto ditto.—BY THE BENGAL GOVERNMENT.

Diwān-i Nigār, 4 copies. By Babu Joygopal Bysack.—BY THE AUTHOR.

Garcin de Tassy's Cours d' Hindoustani—Discours D'ouverture, du 1^{er}
Decembre 1862.—BY THE AUTHOR.

Journal of the Royal Asiatic Society, Vol. XX. Part I.—BY THE ROYAL
ASIATIC SOCIETY OF LONDON.

Notices of the Proceedings of the meeting.—BY THE SAME.

Oriental Baptist for October, 1862.—BY THE EDITOR.

Oriental Christian Spectator for September, October and November, 1862.
—BY THE EDITOR.

The Calcutta Christian Spectator for January, 1863.—BY THE EDITOR.

Selections from the Records of the Bombay Government, Nos. LXVI. &
LXVII.—BY THE GOVERNMENT OF BOMBAY.

Selections from the Records of the Government, North-Western Provinces,
Part XXXVIII.—BY THE GOVERNMENT N. W. PROVINCES.

Narrative of the course of Legislation, during the official year 1861-62.—
BY THE BENGAL GOVERNMENT.

Annual Report on the Administration of the Punjab Territories for the
year 1861-62.—BY THE SAME.

Annual Report on the operations of the Post Office of India, for the year
1861-62.—BY THE SAME.

Annual Report on the Administration of the Central Provinces, for the
year 1861-62.—BY THE SAME.

Annual Report on the Administration of the Electric Telegraph, for the
year 1861-62.—BY THE SAME.

Lieut.-Col. Hamilton's Report on the Shevaroy Hills.—BY THE MADRAS
GOVERNMENT.

Ditto ditto on the Pulni Mountains.—BY THE SAME.

Murdoch's Indian Year-Book for 1861, a review of Social, Intellectual and
Religious Progress in India and Ceylon.—BY THE COMPILER.

Proceedings of the Royal Geographical Society of London Vol. VI. No. 5.
—BY THE SOCIETY.

The Quarterly Journal of the Geological Society, Vol. XVIII., No. 72.—
BY THE SOCIETY.

List of the Geological Society of London, Nov. 1862.—BY THE SAME.

Charter and Bye-Law of the Geological Society of London.—BY THE SAME.

Returns shewing the operations of the Income Tax Act in the N. W. Provinces, for 1860-61.—BY THE GOVERNMENT N. W. PROVINCES.

Photographs and Notes descriptive of the tribes of Berar.—BY THE GOVERNMENT OF INDIA.

A complete set of Photographs of Indian tribes prepared under the orders of the Bengal Government for the London Exhibition.—BY THE BENGAL GOVERNMENT.

Jahrbuch der Geologischen Reichsanstalt, Vol. XII. No. 3.—BY THE VIENNA GEOLOGICAL MUSEUM.

Dr. Weber's *Ueber der Vedakalendar*, Namens Jyotisham.—BY THE AUTHOR.

Exchanged.

The Athenæum for October and November, 1862.

The London and Edinburgh Philosophical Magazine, Vol. XXIV. Nos. 162 and 163.

Purchased.

Mahābhārata translated by Ph. Ed. Foucaux.

Revue des deux Mondes for October, November and December, 1862.

Journal des Savants for October and November, 1862.

Tornberg's *Ibn-El-Athiri*.

Revue de Zoologie, Nos. 9 and 10, 1862.

The Annals and Magazine of Natural History for November and Dec., 1862.

The American Journal, Vol. XXXIV. No. 101.

The Parthenon, Vol. I. Nos. 25 to 33.

Grimm's *Deutsches Wörterbuch* Dritter Band.

Brugsch's *Reise der K. P. Gesandtschaft Nach Persien*, Vol. I.

Dr. T. C. Jerdon's *Birds of India*, Vol. I. Two copies.

Annales des Sciences Naturelles—Botanique. Vol. XVII. Nos. 1, 2 and 3.

Report of the Curator, Zoological Department.

(Continued from Vol. XXXI. p. 345.)

III. W. T. Blanford, Esq., of the Indian Geological Survey. A collection of sundries from different parts of Burmá.

MAMMALIA.

PRESBYTIS PHAYREI, nobis; from Arakan; NYCTICEJUS TEMMINCKII and SCOTOPHILUS COROMANDELIANUS, from Thayet Myo, on the Irawádi (being two of the commonest Bats throughout India, Burmá, and the Malayan peninsula). Also RHIZOMYS BADIUS, Hodgson, from Arakan.

TUPAIA FERRUGINEA (var. *peguana*, Lesson). Also a very common species in the Burmese countries, ascending northward to the Khásya hills, and likewise inhabiting the vicinity of Dorjiling. Specimen from "Arakan mountains."

*SCIURUS BLANFORDII, nobis, *n. s.* (described Vol. XXXI, *J. A. S.* p. 333.) From the neighbourhood of Ava—"common on the Shán hills, less so in the neighbourhood of the river near Ava."

MUS CONCOLOR, nobis, young described, *J. A. S.* XXVIII, 295, and adult (unnamed, noticed in preceding page). "House Rats, from Thayet Myo." This is rather a great Mouse than a Rat, if the distinction can be understood; very like *M. MUSCULUS*, except in being much larger, with a proportionally longer tail. Length of adult male, taken out of spirit and the fur dried—head and body $4\frac{1}{2}$ in., and tail $5\frac{1}{4}$ in.; ear-conch (posteriorly) $\frac{3}{16}$ in.; hind-foot 1 in. Its close similitude to *M. MUSCULUS* renders further description unnecessary; except that the paler colour of the lower-parts has a peculiar reddish-sandy or faint vinaceous tinge (a sort of *isabelline* hue), and the fur of the back is distinctly spinous to the sense of touch. In the thatched roofs of the Burmese up the Salwin river, I several times observed a small long-tailed Rat, which I very strongly suspect, indeed feel quite sure, was of the present kind, but I was unable to obtain a specimen.† An old stuffed example in the Society's collection, from Malacca, seems also, perhaps, to be

* I find that I have referred to this in *J. A. S.* XXXI, 391.

† Since writing the above, I have been assured, positively, that *CORVUS SPLENDENS*, of either race, does not occur, either at Pinang, Malacca, or Singapore.

identical: though I have my doubts, and I have found several specimens, obtained by the late Major Berdmore at Schwe Gyen.

AVES.

IERAX EUTOLMOS, Hodgson. From Shán hills E. of Ava. "Said to live on beetles. In the Southern Tenasserim Provinces, the **I. FRINGILLARIUS**, (Drapiez), begins to appear, and is the only species which I have seen from the Malayan peninsula. In fine specimens of this, the whole abdominal region is deep ferruginous, contrasting with a white breast (in general tinged a little with ferruginous); but the flanks and *tibial plumes* are always deep black. **I. EUTOLMOS** is the species which approaches nearest to Edwards's figure and description of **I. BENGALENSIS**, (L.); but is conspicuously distinguished by its broad white band across the nape, continuous with the broad white supercilia, also by its deep ferruginous throat and *tibial plumes*; but what appear to be the young have rufous forehead and supercilia, and a white throat. **I. BENGALENSIS** is a race which still remains to be verified. **I. MELANOLEUCOS**, nobis, has no ferruginous colouring whatever, and pure white tibial plumes; being also rather larger than the others. The Society's only specimen was received alive from Asám; and another is noted in the Catalogue of the India-house Museum, the habitat of which is unknown.

BUCEBOS CAVATUS, L. Head from Ava.

B. ALBIROSTRIS, Shaw. "From Shán hills. The same species is common along the base of the Arakan hills in Pegu. I have not met with it on the alluvium." It seems to be common throughout Burmá, and in the forests of Upper Martaban, together with the preceding. It is not generally known that the Hornbills are capital eating, as I can testify from experience.

CERYLE RUDIS, (L.) "More common above Ava than in Pegu."

ALCEDO MENINGTING, Horsf. (*A. asiatica*, Swainson) "Replaces on the sea-coast the **A. BENGALENSIS** of the interior."

HALCYON LEUCOCEPHALUS, (L.) The Burmese race seems always to have a somewhat albescent cap.

MEROPS QUINTICOLOR, Vieillot. (Obtained also by myself near Maulmein, and in Upper Martaban; likewise **M. PHILIPPINENSIS** at Rangoon; and **M. VIRIDIS** everywhere, mostly with a redder head than in India. I observed numbers of this last species bur-

flowing into the hill-side (soft laterite), along deep road-cuttings near Maulmein.)

MEGALAIMA INDICA, (Latham). Common here and there; but in general less so than *M. LINEATA*, (Vieillot), the voice of which is quite similar to that of *M. CANICEPS*, (Franklin).

MULLERIPICUS PULVERULENTUS, (Tem.). "Shán hills E. of Ava. Very noisy. Only met with once, in a small flock of five or six, at a height of about 2,000 ft., in the Shán hills, east of Ava."

MULLERIPICUS FEDDENI, Blanford. (*M. JAVENSIS* of Burmá, auctorum.) Differs from *M. JAVENSIS*, (Horsf. v. *leucogaster*, Tem.,) of the Malay countries, by its white rump; in which it resembles *M. HODGSONI*, Jerdon, of Malabar: while the extent of slightly buffy-white colouring on the inside of the wing is greatly increased occupying the basal half of the remiges. In *M. HODGEI*, nobis, of the Andamán islands, the plumage is wholly black, with the exception of the usual crimson marks on the head. In other respects, these four races bear a near resemblance to each other.

PICUS BLANFORDI, nobis, *n. s.* Very like *P. MAHRATTENSIS* of India; but the white markings generally more developed, as especially shewn on the wings and tail. It is just barely separable as a race.

GECCINUS VIRIDANUS, nobis. "From banks of Irawádi." I observed it numerous in Martaban, as also *G. OCCIPITALIS*; (Vigors).

G. CHLOROPUS, (Vieillot). "From the same place as the *PULVERULENTUS*."

TIGA INTERMEDIA, nobis. "From Thayet Myo, where not very rare." I obtained both this and the preceding species on the Salwin, and also in the forests of Upper Martaban. In the same habitat, the diminutive *PICUS MOLUCCENSIS* (var. *canicapillus*, nobis) abounded; and I obtained *HEMICIRCUS CANENTE*, (Lesson), at the base of limestone hills along the Salwin.

CUCULUS TENUIROSTRIS, Gray. "Near Ava." Likewise obtained by myself: as also *C. CANORUS* at Moulmein, in immature plumage; *C. HIMALAYANUS* in Upper Martaban; *C. STRIATUS*, Drapiez, plentifully in the rainy season, when very musical, on the hills near Maulmein; *C. VARIUS* at Maulmein; and *CRYSOCOCCYX* (*Trogon maculatus* of Brown's Illustrations) once at Maulmein.

HARPACTES ERYTHROCEPHALUS, Gould. A particularly fine pair.

CORVUS SPLENDENS, Vieillot. "The common Crows in Mandell have the grey mark on their necks as distinctly as the Crows of Calcutta." In Akyab the Crows are also of the common Indian race; which appeared for the first time in Khyouk Phao on the 7th December, 1856, on which day (as I am informed by Major Ripley) a party of seven individuals arrived there, which have since stocked the neighbourhood. South of Khyouk Phao, this Crow has still no representative in Arakan; but across the mountains which divide that province from Pegu, in the valley of the Irawádi, again at Maulmein, Tavoy, and as far south as Mergui, it is replaced by a wholly black race, quite similar both in form and habit, but having a much shriller voice (a sort of *shrieking* caw, if possible still more inharmonious than that of the other). There is just a very faint tinge of ashy on the neck and breast, where the common Indian Crow is pure cinereous; but this must be specially looked for to be remarked. In the Ceylon race, the grey of the neck and breast is much darker than in that common (I believe) to all India; but very far from black as in the Crows of Burmá. Whether this race extends to the Malayan peninsula, I am unaware; but we know little of the ornithology of that peninsula northward of the latitude of Pinang. The large black Crow of all India (*C. CULMINATUS*), extends throughout Burmá and the Malayan peninsula, and is doubtless the Sumatran *C. corax* apud Raffles; but, in the southern portion of the Malayan peninsula, there is another large black Crow with remarkably long bill (*C. MACRORHYNCHOS*, Vieillot), which again is distinct from the *C. ENCA*, Horsf., of Java and other islands further east. In Burmá, as in India, the *C. CULMINATUS* is diffused in pairs over the country, and is found even in the depths of the forest, remote from human habitations; whereas the black race of *C. SPLENDENS*, like the grey-necked race, is only observed near towns or populous villages. The difference of these two races corresponding to that of the Carrion and Hooded Crows of Europe, which are currently regarded as different species.*

* The Jackal has only recently occurred about Akyab; though, for years past, it has frequented the country through which the Koladyne river flows into Akyab harbour. It also occurs, rarely, about Prome, and thence northward to Ava; but nowhere in the maritime provinces of British Burmá, south of Akyab, where (as before remarked) it has only lately made its first appearance.

The common House Maina (*ACRIDOTHERUS TRISTIS*), and the representative of the Pied Starling (*STURNOPASTOR SUPERCILLIARIS*), I observed abundantly so

• *CRYPsirina cucullata*, Jerdon (*J. A. S.* XXXI, p. 341).
 “Thayet Myo.”

TEMENUCHUS BURMANENSIS, Jerdon (p. 342.) “Common throughout Burmá.” I did not meet with it.

STURNOPASTOR SUPERCILIARIS, nobis. Differs from the Indian race in having a distinct white supercilium, in addition to the white ear-coverts, with streaks of white also tipping the feathers of the forehead. One specimen has a white-necked collar; but this I take to be abnormal. Just a distinctly recognisable race; and as well distinguished as others which are accepted as such.

EUSPIZA AUREOLA, (Pallas). “Twenty miles above Ava.”

EUSPIZA RUTILA; *Emberiza rutila*, Pallas. A very pretty Bunting; the male uniformly reddish-ferruginous or rufous-bay, with the lower parts, from the breast, bright (though not deep) yellow; the primaries and rectrices dusky; and the wings underneath white anteriorly. Closed wing 3 in. From S. Arakan. One specimen only. Akin to *EU. AUREOLA* and others.

MIRAFRA AFFINIS, Jerdon. Upper Pegu.

GARRULAX MONILIGER, (Hodgson.) “Puppa hill, near Pagan, where not very common. Since shot near Thayet Myo.”

CHATARRILEA GULARIS, nobis, *J. A. S.* XXIV, 478. “This bird is extremely abundant among the low thorn bushes which cover the dry country about Yenankhyoung and Pagan. It is just as common near Ava.”

MEGALURUS PALUSTRIS, Horsfield. “Found in much the same places as the *CHATARRILEA EARLEI*; viz. in long elephant-grass; but

far south as Mergui; but am unaware that either has been recorded from the Malayan peninsula. As in Ceylon, the House Maina of the Tenasserim Provinces is darker-coloured than in India.

When first at Akyab, during the rainy season, I remarked the British Tree Sparrow (*PASSER MONTANUS*) to be the common species about the streets; considerably out-numbering the Indian House Sparrow (*P. DOMESTICUS*, *Ind. var.*): whereas, in the cold season, the latter is the prevalent species about Akyab. Southward, however, I only on two occasions saw the common Indian Sparrow; once at Maulmein, and once in a Burmese village higher up the Salwin; whereas the Tree Sparrow is everywhere in extreme abundance, extending southward to Singapore (*J. A. S.* 1859, p. 443), and likewise inhabiting Java; having precisely the same habits as the other. I observed it, numerous, as far south as Tavoy and Mergui. At Thayet Myo, on the Irawádi, Dr. Jerdon informs me that not only are *P. DOMESTICUS* and *P. MONTANUS* common, but also a third species my pretty little *P. FLAVEOLUS*. When at Palphoon, in Upper Martaban, in November last, three or four pairs of *P. MONTANUS* appeared for one day only, entering the few human abodes in the most familiar manner, and apparently seeking convenient nooks for nesting-places; but I saw no others in that wild forest region.

its song is finer and its flight much stronger than that of the MALACOCERCUS group. It generally towers when it rises from the grass, and takes long flights. I have only met with this bird above Ava,—near Thayet Myo, where CH. EARLEI and CH. GULARIS are common. CH. EARLEI I shot thirty miles above Ava.” M. PALUSTRIS I observed in considerable abundance in low brushwood about Akyab harbour. CH. EARLEI I have not yet seen from the Burmese region; but Col. Phayre obtained CH. CAUDATA in addition to CH. GULARIS.

LANIUS HYPOLEUCOS, nobis. “Ava.” Extremely common during the cold season near Maulmein; where it takes the place of L. PHÆNICURUS, Pall., so abundant in lower Bengal and also about Akyab. L. HYPOLEUCOS has been received from Bankok.*

PETROCINCLA CYANEA, (L.) “Common from Kenankhyoung as far as I went, viz. to Malí, nearly 100 miles above Ava.” I found this species everywhere plentiful in Burmá, and very tame and familiar, *i. e.* during the cold season. Some individuals were undistinguishable from the S. Indian race (*A. pandoo*, Sykes), others from the E. Himalayan race (*A. affinis*, nobis), and the Chinese and Philippine race (*A. manillensis*) is again equivalent, and all (with the Kashmirian (*A. longirostris*) cannot be satisfactorily distinguished from P. CYANEA of S. Europe and N. Africa. •

CYORNIS RUBECULOIDES, (Vigors). “Fifty miles above Ava. Occurs I think only in forest. I shot it also at 2000 ft. in height upon the Shan hills.” Not uncommon in Burmá during the cold season.

GRAUCALUS MACEI, Cuv.

PECNONOTUS NIGROPILEUS, Blyth. “Ava. Common throughout Burmá.” In Arakan, replaced by P. HÆMORRHOUS, as in Bengal by P. CAFER. The habits and notes of all three are as similar as can well be.

PRATINCOLA LEUCURA, Blyth. A specimen of this bird was procured by Sir A. Burnes in Scindh; I have never seen it from the vicinity of Calcutta, but Dr. Jerdon lately observed it plentifully in the country about Colgong and Caragola, on the main stream of the Ganges, and also at Thayet Myo on the Irawádi. Mr. Blanford

* There are four distinguishable races of Shrikes, which are very nearly akin.

1. L. SUPERCILIOSUS, L. From the Malayan peninsula.

2. L. PHÆNICURUS, Pallas. India generally; Arakan.

3. L. ARENARIUS, nobis. Desert region of N. W. India.

4. L. LUCIONENSIS, L. China; Philippines, Ceylon; Andamans (!)

writes—"It abounds in long grass on the river-banks in Lower Pegu, and I found it equally common sixty miles above Ava." It has doubtless often been confounded with *PR. INDICA*; from which it is readily distinguished by the large quantity of white on the inner webs of the tail-feathers.

RHODOPHILA MELANOLEUCA, Jerdon, *n. g. et sp.* This curious little bird was discovered, not long ago, by Dr. Jerdon, in plenty about Caragola, on the main stream of the Ganges, where it haunted the interior of the wild rose-bushes (*Rosa involucrata*), there constituting much of the ordinary low jungle; and never perching on the topmost sprays, like the Stonechats and other *vazicolinæ*. Mr. Blanford has since obtained in Arakan. The form appears to me to approximate *Curruca* most nearly; but the tarsi and toes are more slender, and the claws more gracile and elongated. The wings and tail are also more graduated; and the general plumage softer. Colours remarkable; plain glossy black above (inclusive of the ear-coverts), and plain white below. Bill and feet black. Length of closed wing $2\frac{3}{4}$ inch; of tail $2\frac{1}{2}$ inch. I shall leave Dr. Jerdon to describe it more in detail.

PHYLORNIS AURIFRONS, (J. and S.) "Near Thingadau, seventy miles above Ava; also Thayet Myo." I obtained it at Maulmein; and *PH. COCHINCHINENSIS* in the forests of Upper Martaban.

LEUCOCERCA ALBOFRONTATA, (? Franklin.) Here, again, the race is a little different from the Indian one; being just distinguishable by having the white of the forehead and supercilia not so broad, nor meeting round behind at the occiput. There is also not so much white on the tail-feathers. Upper Pegu.

IOBA TYPHIA, (L.) "Common throughout Burmá."

ORIOLOUS MELANOCEPHALUS, Gm. "Seventy miles above Ava. I have shot this and three other species near Thayet Myo." *O. MELANOCEPHALUS* seems to be common throughout Burmá, and extends down the Malayan peninsula; being quite similar to the Bengal race, and constantly distinguishable from that of Malabar and Ceylon (*O. CEYLONENSIS*, Bonap.) *O. INDICUS* (*v. chinensis*) is also common in the Burmese region, and *O. TENUIROSTRIS*, nobis, is less so. I obtained a mature female of the latter at Maulmein, and doubt if the mature male is yet known. Specimens of *O. INDICUS* from China are undistinguishable from Indian examples, and appear to be the *O.*

chinensis, L., et *O. cochinchinensis*, Brisson,—but not *O. ACROCHYNCHOS*, Vigors, of the Philippines. *O. TRAILLI* inhabits the higher mountains of Burmá; but is not likely to have been obtained by Mr. Blanford at Thayet Myo.*

NECTARINIA ASIATICA, (L.) “Yenankhyoung.” The most widely diffused of the Asiatic species. At Maulmein I obtained *N. FLAMMAXILLARIS*, nobis (there common), and *N. HASSELTII*, Tem. (apparently rare). The last ranges from Arakan to Singapore; but *N. FLAMMAXILLARIS* is replaced in the Malayan peninsula by *N. PECTORALIS*, Horsfield.

DICÆUM CHRYSOBREUM, Tem. “River banks, seventy miles above Ava.” Arakan, Tenasserim Provinces, Malayan peninsula.

D. CRUENTATUM, (L.) “Thayet Myo.” The most widely diffused of Asiatic species of this genus. I observed it in particular abundance in the vicinity of Mergui; and it is not rare near Calcutta.

D. MINIMUM (Tickell): young, *Certhia erythrorhyncha*, Latham. “River banks seventy miles above Ava.” India generally; Ceylon; Burmá; particularly common in the jungle-clad hills about Maulmain.

CROCOPUS VIRIDIFRONS, nobis. “Ava.” I never obtained this green pigeon; but *OSMATRERON PHAYREI* (p. *antea*) abounded in the forests of upper Martaban, and *O. BICINCTA* is common near Maulmain, with probably *O. PHAYREI* also.

TURNIX BLANFORDII, nobis, *n. s.* Like *T. DUSSUMIERII* of India, but much larger; holding the same relationship to that species which the *T. SYKESI* of India does to the *T. ANDALUSICA* of S. Europe and N. Africa. Col. Phayre had long previously sent a specimen of this race from Arakan. Length of closed wing 4 inches.

TURNIX OCELLATA (Scopoli.) Bengal race. “Common in the grass on the top of Pappa hill.” The three Indian species of this genus were obtained in the vicinity of Thayet-myo by Dr. Jerdon.

REPTILIA.

Two “shells” of Tortoises. One from Ava is decidedly *EMYS TRIJUGA*, Schweigger, as described and figured in Gray’s *Catalogue of Shield Reptiles* (1855) p. 20 and pl. IV. This species is new to the Society’s museum, though stated to inhabit “ponds at Calcutta.” I

* The Andamán Oriole agrees best with *O. HORSFIELDI*, Bonap., *Consp. Avinu.*

have hitherto vainly sought for it, however, among the many hundreds of EMYDES from this neighbourhood which I have seen in the course of more than twenty years of collecting.* Length of the Ava specimen, which I consider to be full grown $9\frac{1}{2}$ in. The young of this species is figured as *E. Belangeri*, Lesson, in the Atlas to Belanger's *Voyage aux Indes Orientales*; and in the Society's copy of that work, purchased at the sale of the late Dr. H. Walker's library, *E. Belangeri* is identified by that naturalist (in a pencil-note) with *Geomyda tricarinata*, nobis (*J. A. S.* XXIV, 714), from Chaibasa, central India; but this is a mistake. I doubt if EMYD TRICARINATA, nobis, attains to nearly so large a size as *E. TRIJUGA*, and it is readily distinguished by the uniform yellowish-white colour of the *plastron*, the second, third, fourth and fifth pairs of plates upon which are of about equal size, constituting a strongly marked distinction from *E. trijuga*. The carapace of our only specimen is $5\frac{1}{2}$ in. long. Another (forwarded many years ago to the India-house museum) was quite similar. The palms and soles of this species are much dilated (or roundly *heeled*, it might be termed), indicating terrene habits (whence I formerly placed it in GEOMYDA). Another species which has been confounded with *E. TRIJUGA*, is the GEOCLEMYS SIBA, Gray, from Ceylon, of which we possess two specimens presented by Dr. Kelaart.

Mr. Blanford's other Tortoise from "Arakan hills," is the adult of CYCLEMYS DENTATA, Gray, *ibid.*, p. 42 and pl. XIX.; but with age this species elongates and loses the dentate appearance of the posterior margin, so as to be hardly, if at all, recognisable from Gray's plate. Length of adult $8\frac{1}{2}$ by $5\frac{1}{2}$ in.; of another less elongated and retaining the posterior denticulation 8 by 6 in.

In the same collection is also a large skull of BATAGUR BASKAR, Gray (*v. Tetronyx Lessonii*, D. and B., &c. &c.).

A common EMYD of the southern Tenasserim provinces is the *E. CRASSICOLLIS*, Bell, as figured in Hardwicke's *Ill. Ind. Zool.* This species I designated *E. nigra* in *J. A. S.* XXIV, 713, having mis-

* The commonest Calcutta species is *E. TECTUM*; next *E. HAMILTONII* and *E. THURJII*; *E. OCCELLATA*, D. and B., is much more rare; *E. TENTORIA* (closely akin to *TECTUM*) belongs to the Indus river-shed, and is very doubtfully Gangesitic; BATAGUR BASKAR, Gray (*TETRONYX LESSONII*, D. and B.,) is brought abundantly to Calcutta to be eaten by certain classes of natives; EMYDA PUNO TATA and TRIONYX GANGETICUS are common, and of CHITRA INDICA I have obtained one specimen only.

taken, at that time, another species for the true *CRASSICOLLIS*, received from the Batavian Society in 1844. This error is indicated by Dr. Gray in the *Ann. Mag. A. H.* XIX, (1857), p. 343; but he nevertheless enumerates *E. NIGRA* as a distinct race.* The Javanese species does not appear to be described, and may be named

E. NUCHALIS, nobis, *n. s.* from the unusual size of its medial nuchal plate, which is of a triangular shape. The next four medial dorsal plates are elongate, quadrangular, sub-hexagonal, the sixth being triangular with apex to the front. Three dorsal ridges conspicuous in the young animal; the lateral placed very high upon the costal plates, almost submarginally. Posterior border very slightly dentate in the young animal; whereas, in the young of *CRASSICOLLIS*, it is strongly dentate. Plastron flat, and laterally angulate; the four principal pairs of sternal plates mostly about equal and nearly quadrate, though in some the second pair are much shorter than broad, and the third pair are correspondingly enlarged. Colour, olive brown, obscurely mottled with darker brown, the lateral angles of carapace and plastron yellowish; the latter is reddish-brown, more or less deeply clouded with black. Head blackish, with yellow line on the eye, meeting its opposite above the nostrils, another yellow line under the eye, a third behind the eye, a fourth bordering the upper jaw, and other yellow markings on the lower jaw: rest of naked parts yellowish infuscated above. Shell of largest specimen $6\frac{1}{4}$ by $4\frac{3}{4}$ in. Hab. Java?

In the southern Tenasserim provinces is also found abundantly the *EMYS BERDMORII*, nobis, *J. A. S.* XXVII, 281 v. *E. ocellata* apud nos, *J. A. S.* XXII, 645, XXIV, 481, and *Batagur ocellata* apud Gray, *Ann. Mag. N. H.* XIX, (1857), p. 348; but not *B. ocellata*, apud Gray, *Catalogue of Shield Reptiles* (1855), p. 36, which refers to the true *E. OCELLATA*, Dumeril and Bibron, a species which I have only seen from the neighbourhood of Calcutta. The two are very conspicuously distinct, and are not even nearly akin, as members of the same genus. They will, therefore, henceforth stand as *BATAGUR BERDMORII*, nobis, from Martaban and southern Burmá; and *B. OCELLATA*, (D. and B.), from Lower Bengal.

* Dr. Gray in his catalogue of *Shield Reptiles*, notices specimens of *E. CRASSICOLLIS* from "India" and "Ceylon." I doubt these *habitats* exceedingly. An American *C. NIGRA* is also given by Dr. Gray.

In *J. A. S.* XXII, 640, I described a land Tortoise, by the name *Testudo megalopus*, which I now consider to be merely an enormous specimen of *T. STELLATA*, Schweigger; the species inhabiting peninsular India and Ceylon.* In XXIII, 301, it was recorded that the Rev. Dr. Mason recognised the supposed megalopus as the species with which he was most familiar in Burmá; but there is a nearly similar land Tortoise, which would appear to be very common in Lower Pegu, and which I cannot doubt is the species referred to by Dr. Mason. I name it—

TESTUDO PLATYNOTUS, nobis, *n. s.* Very similar to *T. STELLATA*; but averaging a larger size, and conspicuously distinguished by being quite flat upon the back; the plates not rising in the centre, and the bosses presenting the appearance of having been ground flat by attrition in all the specimens observed. The radiating marks are also broader and less numerous, in general numbering six only on each vertebral plate, three on each side of the centre, as compared with *T. STELLATA* and *T. GEOMETRICA* (from S. Africa), the carapace is conspicuously broader but not so high; and the species is much more obviously distinct from the two latter, than these are from each other.† Length of largest specimen 11 by $7\frac{1}{2}$ in. and height of carapace $4\frac{1}{4}$ in. I have not seen the plastron. The carapaces are used abundantly in the Rangoon bazar for baling out oil from earthen vessels. In each oil dealer's shop there are three or four of them in constant use; but the entire animal is difficult to be obtained, as the Burmáns are so fond of eating them. I was promised specimens of the animal, as a common inhabitant of the province; but did not succeed in procuring one. Three good illustrative carapaces were, however, obtained, showing about the extent of variation; and I had to pay a tolerable price for them.‡

* *Homopus Burnesii*, nobis, *J. A. S.* XXII, 642,—*TESTUDO* HORSFIELDI Gray, *Catalogue of Shield Reptiles*, (1855) p. 7 and pl. I, *Hab.* Afghanistan (Nipal? *P. Z. S.* 1861, p. 219).

† In two or three S. African specimens of *T. GEOMETRICA* (*J. A. S.* XIX, 88) the usual small nuchal plate is wanting. This appears never to exist in *T. STELLATA* and *T. PLATYNOTUS*.

‡ It will be convenient here to enumerate the *Testudinata* of the Burmese provinces, so far as hitherto ascertained.

1. *TESTUDO PHAYZII*, nobis, *J. A. S.* XVII, 560, XXII, 639. *Hab.* Arakan; Tenasserim provinces.

2. *T. ELONGATA*, nobis, *J. A. S.* XXII, 639, XXIV, 712, XXV, 448; Gray, *Ann. Mag. N. H.* XIX, (1857) p. 242. From Arakan to Mergui. This species has been bred in my garden, and the young do not possess the lengthened form of the

Five Snakes sent are CYLINDROPHIS RUFA, (Schn.), LYCODON AULICUS, DIPSAS CYNODON, TROPIDONOTUS UMBRATUS, and FA-

adult (as in CYCLEMYS DENTATA and sundry others). It would appear to exhibit a near resemblance, at first sight, to the American T. TABULATA. (Vide Gray, loc. cit.)

Of course this is the species referred to as T. ELONGATA, Gray (!) from Camboja, in P. Z. S. 1861, p. 139, (as well, however, may Dr. J. E. Gray refer to HOMO SAPIENS, Gray, or EQUUS CABALLUS, Gray! I claim the honour—such as it is of having named the three fine Indo-Chinese species of TESTUDO, as yet discovered. Palmam qui meruit ferat).

3. T. PLATYNOTUS, nobis, ut supra. Valley of the Irawadi.

4. E. TRIJUGA, Schweigger; young, E. BELANGERI, Lesson. Ava; Bengal (rare); Coromandel coast.

5. E. CRASSIOOLLIS, Bell; E. nigra, nobis, J. A. S. XXIV, 713. Tenasserim provinces; Malayan peninsula; Sumatra; Java; Camboja, (P. Z. S. 1861, p. 140).

6. BATAGUR BERDMOREI, Emys Berdmorei, nobis, J. A. S. XXVII, 281: Syn. ut supra. Sitang and Tenasserim rivers.

7. B. BASKA, Gray; Tetraonyx Lessonii, D. and B., Gray, Ann. Mag. N. H. XIX, (1857), p. 343, common in Lower Bengal; and a large skull now sent from the Irawadi by Mr. W. T. Blanford.

8. B. DHONGOKA; Emys dhongoka, Gray, Hardw. Ill. Ind. Zool.; young, E. trioittarta, D. and B. An estuary species chiefly, according to my experience; common along the eastern side of the Bay of Bengal and also in the Nerbudda. It is now unfrequently brought to the Maulmein fish-bazar.

9. CUORA AMBOINENSIS, Gray; Testudo amboinensis, Dandin; Cistudo amboinensis, D. and B. Tenasserim provinces; Camboja; Malayan peninsula and Archipelago; Philippine islands.

10. CYCLEMYS DENTATA; Cistudo dentata, Gray; Cycl. orbiculata, Bell; very young, Tetraonyx affinis, Cantor. Arakan; Pegu; Martaban; Tenasserim provinces; Malayan peninsula; Java; Borneo.

11. C. PLATYNOTA, Gray, (Catal. 1855); Emys platynota, Gray, Hardw. Ill. Ind. Zool.; Cantor, J. A. S. XVI, 609; Blyth, J. A. S. XXIV, 714. Tenasserim provinces; Malayan peninsula; Sumatra.

12. PLATYSTERNON MEGACHALPUM, Gray, P. Z. S. 1831, p. 106; Hardw. Ill. Ind. Zool.; J. A. S. XXIV, 481. Sitang river; China. The adult of this animal is still a desideratum in our collection.

13. EMYDA PUNCTATA, Gray; Cryptopus granodus, D. and B. Very common throughout India; and received from the Sitang valley.

14. TRIONYX GANGETICUS, Cuv. India and Malay countries; also received from the Sitang river.

The marine species of the Bay, including CHITRA INDICA, Gray, (Gymnopus lineatus, D. and B.), are sufficiently well known, and are given in the late Dr. Cantor's Catalogue of Malayan reptiles, J. A. S. XVI, pp. 616 to 620. To the list of them, however, Major Tickell has just added SPHANJIS CORIACEA, (L.)

All of the fourteen species enumerated are illustrated by one or more specimens in the Society's museum; and most of them by a series of successive ages, from youth to maturity.

It is worthy of remark that of three species extremely common in Lower Bengal, viz. GEOCLEMYS HAMILTONII, E. THURJII, and BATAGUR TECTUM, and a fourth which has not hitherto been observed elsewhere, viz. B. OCELLATUS, (D. and B.), not one appears to inhabit the Burmese countries, so far as hitherto ascertained. They appear rather to be peculiar to the gangetic river-shed, with perhaps also the Brahmputran; but even the latter is doubtful so far as I have been able to learn.

In the Proceedings of the Zoological Society for 1861, p. 139-40, Dr. Gray gives a list of some reptiles received from Camboja; in which the following

STOLATUS; all from Thayet Myo; and four species of BATRACHIA from near the mouth of the Irawádi are LYMNODYTES ERYTHREUS, RANA VITTIGERA, R. RUGULOSA (vide *J. A. S.* XXIV, 722), and BUFO MELANOSTICTUS.

A number of fishes and *Crustacea* are likewise forwarded from different localities; but these I have not the time to examine properly at present. The class of fishes is that to which I devoted especial attention during my late excursion; and I have more to place on record regarding the fishes of Burmá than can be conveniently compressed into an ordinary Report. I will only remark that Mr. Blanford's 'Bream-like fish' from Ava is the *Cyprinus cotis*, B. H., OSTEOBAMA COTIS apud nos, *J. A. S.* Vol. XXIX. p. 158, which is more emphatically bream-shaped than the *Ost. MICROLEPIS*, nobis, *ibid.* I obtained both species in abundance, and they acquire a considerable size, as I anticipated, the COTIS being the larger of the two, so far as I have seen.

IV. The Rev. C. S. P. Parish, Chaplain, Maulmein. A jar of sundries from Port Blair. When I was at Maulmein towards the close of September last, Mr. Parish was about to visit the Andamans; and I supplied him with a small jar of spirit, in which he obligingly promised to preserve any small animals that he might be able to procure. He has contributed a few additions to our scanty list of the Andamanese fauna, which I distinguish by prefixing an asterisk to their names.

Of mammalia, one ferruginous Bat* CYNOPTERUS MARGINATUS; abundant in all the neighbouring countries.†

species are noted—GEOCLAMYS MACROCEPHALA, Gray, *P. Z. S.* 1859, p. 478, t. XXI, and GEOMYDA SPINOSA, Gray; there is, also, a TRIONYX ORNATUS, Gray, from Camboja, described in *P. Z. S.* 1861, p. 40. G. MACROCEPHALA has likewise been received from Siam; also EMTS SIAMENSIS, Gray, Gunther, *P. Z. S.* 1860, p. 114.

I observe that my highly esteemed old friend, Prof. Thos. Bell, in his 'History of British Reptiles,' (Introduction, p. xviii, remarks that—"The eggs of the land Tortoises, as well as those of the marine Turtles, are generally round; but those of the fresh-water genera are usually more or less oval or elliptical." Those of TESTUDO STELLATA are exceedingly elongated. The eggs of the TRIONYX series are quite globular or spherical, as of the marine Turtles; but those of the EMTS group, as likewise of the land Tortoises (so far as I have seen), are very much elongated and elliptical.

† On the Barren Island volcano, Mr. Parish found the half-devoured remains of a Bat, probably MUS ANDAMENSIS, nobis: the head was wanting, and Mr. Parish did not think the fragment worth preserving; but the Andamanese species is easily*recognised from its size, combined with the peculiar character of

Of birds, **COLLOCALIA NIDIFICA*, (Latham), and *HIRUNDO RUSTICA*, L., juv. (*H. gutturalis*, Scopoli.)

Of reptiles, **GECKO VERUS* Merrem; *TRIMESURUS VIRIDIS* (var. *Cantori*), **LEPTOPHIS ORNATA*; **DIPSAS*—? (very young, but of a species unknown to me); *LYCODON AULICUS* (prettily mottled var., young); and **BUFO MELANOSTICTUS*. The last is the first instance of a batrachian having been received from the Andamans; but it is a very likely species to have been introduced from on board vessels. I have lately had occasion to remark from personal observation how much the small Geckos (*HEMIDACTYLUS*) are conveyed about in boats.

Of fishes, none worthy of remark.

Of crustaceans, *GRAPSUS STRIGOSUS*, (Herbst.); the fine land Crab noticed in *J. A. S.* XXVII, 272; and the common *SQUILLA RAPHEIDA*.

Of mollusks, *CHITOA CUNNINGHAMII*; *PATELLA TESTUDINARIA*; and a small *LIMA*.

(Here it will be convenient to interpolate a brief notice of some novelties from Port Blair, which have lately been received from Lieut.-Col. Tytler, the present Superintendent.)

Col. Tytler has *seen* a small wild *FELIS* on the main island, which, from his description, would seem to approximate the *F. CHAUS* of the neighbouring countries: Dr. Mouat also tells me that he picked up the skull of a small *FELIS*, on the occasion of his visit to the islands which led to the formation of the penal settlement of Port Blair; but that the specimen had been unaccountably lost. Col. Tytler writes—"On the 4th July at 'Aberdeen' I distinctly saw a *FELINE* animal, the size of the European wild cat. This creature walked across the road about 150 yards before me. Its colour was of an uniform light yellow-brown, not unlike the yellow of a Leopard, perhaps lighter, but I could see no marks or spots. On Ross Island

its fur. I may remark that on bare lava, upon Barren Island, Mr. Parish observed a beautiful plant in bloom, which proved to be the ordinarily epiphytic orchid, *DENDROBIUM FORMOSUM*, which is very common in the southern Tenasserim provinces. I observed it plentifully upon trees on the alluvial islands in the Tavoy river.

The naturalists attached to the Austrian 'Novara' expedition describe two species of *MUS* from the Nicobars, as *M. NICOBARICUS* and *M. PALMARUM*; the former of these may prove to be identical with *M. ANDAMENENSIS*. They also describe *PTEROPUS NICOBARICUS* (which is doubtless *Pr. melanotus* of my Mammal Catalogue).

there are several yellow-coloured domestic Cats belonging to the European Naval Brigade here, but these are small, besides which no Cat from Ross Island could swim over to 'Aberdeen;' and where I saw the animal none of the convicts' houses were within half a mile of the place. From the rapid casual view I had of it, I am persuaded that it was a wild animal, and not a stray domestic Cat." This would make a second species of *carnivora* on the Andamans, the other being the *PARADOXURUS* of which we possess the skull of an exceedingly aged individual. Col. Tytler further writes—"There is a great abundance of small Bats on the islands," which remain to be identified.

Of birds, Col. Tytler has sent a fine new Hawk—*HÆMATORNIS ELGINI*, Tytler, *n. s.* Like *H. CHEELA*, (Latham) *undulatus*, Vigors), but of smaller size and much darker colouring, with the occipital feathers less elongated; being further strongly distinguished by the markings of its great alar and caudal feathers. Instead of the broad pale band crossing the tail-feathers of *H. CHEELA*, the new species has a series of three narrow caudal bands, the last subterminal, only $\frac{1}{2}$ in. broad, and followed by $\frac{1}{4}$ in. of the black tip (perhaps in the newly moulted plumage there may be slight albescent extreme tips to the tail-feathers). In lieu of the broad whitish bands which predominate on the under surface of the wing in *H. CHEELA*, our present species has very slight and narrow pale cross-bands, the dark colour much predominating; and the white spots on the anterior portion of the inner surface of the wing are a good deal smaller. "Irides yellow. Bill slate-colour, tarsus yellow; claws black. Extreme length 21 in. by $3\frac{1}{2}$ ft. in extent of wings." Closed wing 14 in.; tail 9 in.; tarse 3 in. "This species," remarks Col. Tytler, "is not uncommon on the main island, where it is seen sitting on the tops of trees. It is more abundant than the *H. CHEELA*."

EURYZONA CANNINGI, Tytler, *n. s.* Most like the Indian bird referred to *EU. CEYLONICA*, (Gme?) but very much larger and finer coloured, with tail proportionally more developed. Entire upper parts and breast, also the lower tail-coverts rich dark ferruginous, nearly approaching to marone; a slight olivaceous tinge about the rump: throat less deep-coloured: the abdominal region, flanks, and tibial plumes, black, with from two to four narrow white bands crossing each feather: under-surface of the wing much the same, but the

great alars are barred with rufous. "Bill yellow, with slight tinge of green: eyes reddish-orange: feet slate green. Length of adult female 13 in. by 21 in. in expanse of wings." Bill to gape $1\frac{1}{2}$ in.: tarse $2\frac{1}{2}$ in.: middle toe and claw $1\frac{7}{8}$ in.: wing $6\frac{1}{2}$ in.: tail $3\frac{1}{2}$ in. The only specimen as yet obtained. The name EURYZONA does not so well apply to this species as to its congeners.

The Indian bird hitherto referred to EU. CEYLONICA is a recognisably distinct race from the true CEYLONICA of Ceylon. The ferruginous colour of the nape does not descend so low on the back, and there is no trace of ferruginous on the wing and tail-feathers. I distinguish it as EU. AMAUROPTERA, nobis.* The distinction is about equivalent to that of PALUMBUS ELPHINSTONII of S. India and P. TORRINGTONII of Ceylon; or that of SARCOGRAMMA GOENSIS of all India and Ceylon, and S. ATRONUCHALIS, nobis, of Indo-China and Malasia. This last bird is common at Akyab.

A DENDROCITTA, of small size, Col. Tytler describes (but has not yet sent† as—

"D. BAYLEYI, Tytler, n. s. A new species, not uncommon on the main island. I name it after Mr. Bayley, the Home Secretary to Government. This beautiful little Pie measures $13\frac{1}{2}$ in. in extreme length with closed wing $4\frac{3}{4}$ in.; bill to gape 1 in.; and tarsus 1 in. Wings and tail nearly black, with broad white patch on wing; head, neck, and throat, dark brown; back more rufous; belly and vent very rufous or chesnut. Tail with 12 feathers (therefore not a *Crypsirina*). Bill and feet dark slate-coloured."

A new Snake forwarded by Col. Tytler I designate as—

TRIPIDONOTUS, TYTLERI, nobis, n. s. Species typical; the head sub-conical, flattened above, with the inter-orbital plate twice as long as broad at middle, and projecting backward so as to form an equilateral triangle between the fronts of the parietals and beyond the orbitals. Colour a bistre-brown above, yellowish-white below, with three to five more or less conspicuous whitish lines on the fore-part of the body, becoming obsolete at about the middle of the length; a transverse dark streak below the eye, and another and broader dark streak

* The late Prince of Canino referred the *Gallinula rubiginosa*, Tem. (*Rallus fuscus*, L. ?) to this division; but it does not belong to it, having much longer toes, and exhibiting other distinctions.

† Since received.—T. C. J.

passing obliquely backward so as to cross the angle of the gape. *Scutæ* 188; *scutellæ* 86 pairs; row of scales 19. (Length of adult 2 ft. $10\frac{1}{2}$ in., of which tail $10\frac{1}{2}$ in.)

V. W. Theobald, Esq., Jun., of the Indian Geological Survey. A small tin of specimens, containing—

Of mammalia, a skin of *LAGOMYS ROYLI*, Ogilby, from the Bala Pass, “inhabiting also other passes in Tibet,”—and a small *Arvicoline* quadruped, for which I find it necessary to establish a new genus.

PHAIOMYS, nobis, *n. g.* Similar to *Arvicola*, but more robust, with a well developed thumb and nail to the fore-foot; tail shortish, and densely clad with short adpressed hairs. Upper rodent tusks inconspicuously grooved.

PH. LEUCURUS, nobis, *n. s.* Length of a female containing six *fœtus*, $6\frac{1}{2}$ in. of which tail $\frac{1}{4}$ in. of a smaller specimen sent, $4\frac{1}{2}$ in., of which tail $1\frac{1}{4}$ in., of hind-foot claws $\frac{7}{8}$ in. Fur dense, very soft and fine, the surface hue greyish-brown on the upper parts; on the lower parts, feet and tail, white, a little sullied: basal two-thirds or more of the upper fur dark slaty. “Ears rounded, of medium size, rather adpressed.”

“These Rats,” remarks Mr. Theobald, “are very numerous near Lake Chomoriri; but can only be shot, as it is next to impossible to dig them out, their holes ramifying over acres of ground. They must migrate, as the whole ground is sheeted in snow for five months. The pregnant female was obtained on the 4th August.

(In Afghanistan, there is an animal of nearly similar habits which was known to our people as the ‘Quetta Mole,’ *MYOSPALAX FUSCOCAPILLUS*, nobis, *J. A.*: XV, 141; but that is more nearly akin to the true Lemmings.)

From the same locality, Mr. Theobald has sent two males and a female of “a *Viviparous* Lizard,” with also an example of the young. It is a *PHRYNOCEPHALUS* with non-prehensile tail, and would seem to be nearly affined to *PHR. OCELLATUS* (Licht), and *PHR. MELANURUS*, Eichwild, briefly noticed by M. M. Dumeril and Bibron (*Hist. Rept.* IV, 516. It is perhaps *PH. TICKELLII*, Gunther (?) noticed in *P. Z. S.* 1860, pp. 167, 173, as inhabiting from 15,200 to 15,300 ft. elevation on the Himalaya. The sexes differ so much that they might well be mistaken for separate species; the female being smaller, and coloured very much like *UROMASTYX HARDWICKII*, but the tail

is variegated with numerous irregular slaty bands, passing to blackish towards and at the tip; lower-parts uniform yellowish-white, except the dusky tail-tip: length $3\frac{1}{2}$ in., of which tail 2 in. Male $4\frac{1}{2}$ in. long, of which tail $2\frac{1}{2}$ in.; extended fore-limb 1 in., and hind-limb $1\frac{1}{2}$ in.: in both sexes a transverse double fold of skin at the throat. Colour of the male dark olive above, with an obscure dark band along the spine, broken into a series of spots, and a nearly similar row of largish dark spots on either side; these spots are set off each with a circlet of pale specks: limbs and tail banded above, the latter with imperfectly alternating lateral half bands, of a dusky grey colour, passing to blackish on the terminal fourth of the tail underneath; there is a great black abdominal patch, and another on the throat. The lower jaw protrudes distinctly beyond the upper one. Longest toe of the hind-foot conspicuously serrated along its inner edge. These Lizards associate in pairs, and form shallow burrows along lake Chomoriri. As the species is probably undescribed, I shall designate it *PHR. THEOBALDI*, nobis, *n. s.*

From Tibet is also sent *MOCOA SIKIMENSIS*, nobis, *J. A. S. XXII*, 652 (previously received from Sikkim and Kashmir); and a small specimen of *LAUDAKIA* (?) *MELANURA*, nobis, (*J. A. S. XXIII*, 738); * also from Simla a Snake there common, *TROPIDONOTUS PLATYCEPS*, nobis, *J. A. S. XXIII*, 297, which species we have only previously received from Darjiling.

VI. Messrs. Edwards and Water, of Penang. A fine pair of *DRACO FIMBRIATUS*, Kuhl; from the west coast of Sumatra. Also a small *CROCODILUS POROSUS* in spirit; an imperfect example of *SQUILLA MACULATA*; and a fine sea mouse, akin to *APHRODITA*, which we have also received from Port Blair and from the Tenasserim coast.

* This Lizard, as I am assured by Mr. Theobald, grows to 18 in. long. It is common.

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*Bhoja Rájá of Dhár and his Homonyms.—By BÁBU
RÁJENDRALÁLA MITRA.*

The name of Bhoja Pramára is the most celebrated in the annals of India. It stands pre-eminent as the emblem of a glorious sovereign, a distinguished author, and a noble patron of learning; and our poetry, our romances and our nursery tales have alike selected it as the theme of their laudations. It is remarkable, however, that little seems to be known of the identity of the individual who gave it such greatness. "While Hindu literature survives," said Col. Tod, "the name of Bhoja Pramára and the 'nine gems' of his court cannot perish," and yet at the time the learned historian of the Rajputs had three claimants before him, every one of whom asserted his right to the glories of the Bhoja Pramára, and he was obliged to admit "that it is difficult to say which of the three princes was the greatest, as they all appear to have been distinguished patrons of science and literature." Since his time the researches of Indian antiquarians have brought to light more than a dozen princes who have, at different times, borne that illustrious name, but whose history is shrouded in mystery which legendary tales, in the absence of authentic evidence, cannot solve. It may not be uninteresting, therefore, to ascertain and bring together the sum of our knowledge regarding the several monarchs of the name of Bhoja that have been from time to time met with. It might, to some extent, help to remove a prolific source of error to many hasty antiquarians who frequently jump into conclusions regarding the age of undated—and not rarely of dated—inscriptions from the mere circumstance of the word Bhoja occurring in them.

The derivation of the word may be traced to the root *bhuj* 'to enjoy,' and in that sense it has been used by the Brahmans from the remotest antiquity. In the third book of the Rig Veda Sañhitá (Chap. III. Varga 20, verse 7) it occurs for the first time as a generic term* to indicate the sacrifice-loving Kshetria sons of Sudása, which fact argues the likelihood of some one of them having borne that word as his specific name. Subsequently we find it in the Mahábhárata,† many centuries before the commencement of the Christian era, as the title of a king who was the foster father of Kuntí, the mother of the renowned Pándavas. He was a cousin (father's sister's son) of S'ura and generally known by the name of Kuntí Bhoja. S'ura, was the father of Vasudeva and Prithá; and the latter when made over to her cousin-german assumed the name of Kuntí.

Immediately after him we meet with a Bhoja in Col. Wilford's "Essay on the sacred Isles in the West,"‡ who was a vassal of Jarásandha. He invited the Magas to his dominion on the banks of the Ganges, and gave his daughter to one of them from whom descended the eighteen families of the Bhojakas. I cannot, however, find any mention of this prince in the *Sám̐ba Purána* to which the Colonel refers his readers, and feel disposed, therefore, to attribute his origin to the imagination of the Colonel's Panditas. His contemporaneity to Jarásandha would make him a contemporary of Vasudeva and Pándu, and consequently of Kuntí Bhoja, with whom he was most probably identical. His country is called *Karac desa*.

The Colonel has a second prince of this name§ who was a relative and friend of Krishna and chief of the town of Bhojapura. This must have been either Kuntí Bhoja himself, who was a cousin of Krishna's father, or a descendant of his who assumed the patronymic of Bhoja. I feel disposed to take the latter alternative, as in the Mahabharata,|| a Bhoja of Bhojapura in Behar, not Kuntí Bhoja, appears in the company of Aswatthámá as a rival of the Pándava brothers for the hand of Draupadí, which would scarcely be probable

* The words are *Ime Bhojá āngiraso virūpá*, which Sáyana explains by *Ime jágam kurvánáh Bhojááh saudásáh kshatriyáh teshám. yájakáh virūpá náná rūpá Medhátithi prithilayo āngirasascha*. Max Müller, Vol. II. p. 928.

† *Adi Parva*, chapter III. Vol. I. p. 161, Calcutta edition.

‡ *Asiatic Researches*, Vol. XI. p. 82.

§ *Loc. cit.*

|| *Adi Parva*, Vol. II. p. 253, v. 6986.

बभूवामा च भोजस्य सर्वशक्त्यन्तर्बरो ।

in the case of Kuntí Bhoja himself, the maternal grandfather of these Pándavas. The dominions of all the three are placed on the banks of the Ganges in Magadha or its neighbourhood. The capital of the last, *Mrittikavati*, was situated on the river Karmanásá which Wilson supposed to be near the modern Bhojpur.

Next to these we come to a Bhoja Rájá who is made to reign 127 years from about B. C. 180 to B. C. 58. He was, according to the Orissan chronicles, "a brave, liberal, just and merciful prince. His court was adorned by the presence of 750 eminent poets, the chief of whom was *Kálidása*, author of the 752 slokas called the *Chának* or *Chátaka* and *Mahá Nátaka*. This Rájá Bhoja invented boats, the weaver's loom, and wheeled carriages, or at least in his time the use of them first became common. In this reign the Yavans from Sindhu Des invaded the country in great force, but Bhoja discomfited and destroyed them, and afterwards captured many of their possessions and cities. He was followed by Vikramáditya who was either a brother or a son of his."* The bungling here of a Bhoja before Vikramáditya of the Samvat era, of Vikramáditya himself, and of the Bhoja of the 10th century, is self-evident and needs no comment. A Bengali romance named *Bhánumatí* makes a Bhoja the father-in-law of Vikrama.

No monumental evidence exists of any of these five princes, and they are interesting only as affording a strong proof in favour of the antiquity of their name. The last two, namely, those of the Orissan chronicles and of *Bhánumatí*, appear to be entirely mythical. I may say the same of three sovereigns of Bengal whose names occur in Pere Teiffenthaler's history of Orissa.† Two of them, viz. Rájá Bhoja with a reign of 75 years, and Samat Bhoja with a reign of 48, are said to have belonged to the family of Gor, and the last, Rájá Bhoja, of a Káyastha family, who reigned 70 years, was the third in descent from Pratáparudra.‡ Their names are so mixed up with those of the kings of Orissa, and so overcast by a misty atmosphere of fable, that they can claim no attention from the sober historian. Most of the reigns given by the Reverend Missionary, range from 70* to 108 years.

* Sterling's History of Cuttack, Asiatic Researches, Vol. XV. p. 259.

† Description Historique et Géographique de l'Inde, Vol. I. p. 472.

‡ Sterling's list has (1) Pertapa rudra (1502 A. C.), 2, Govinda Rao (1524), 3, *Pratāp* Janna, (1539), 4, Mukunda Deo, (1550).

Passing them over we came to the first Bhoja whose era may be ascertained with some certainty. Col. Tod, following a Jain manuscript,* says that he flourished about the end of the sixth century, S. 631 = A. C. 575. He was a sovereign of the Pramára race and had Málava for his dominion. Abbe Bertrand,† following Mir Ali Afsos, makes a Bhoja ascend the throne of Málava 542 years after Vikramáditya, which would give us a Bhoja a century before this sovereign; and Teiffenthaler gives another 426‡ years after Vikrama, both of whom are probably the same with the first prince of Tod, misplaced by blundering chroniclers. Prinsep,§ following the Ayin Akbary, places Bhoja the successor of Munja at the end of the 5th century (483) whom he identified with the first Bhoja of Tod.

The next Bhoja of the Colonel's list lived in Samvat 721 = A. C. 565. According to the Aitpur inscription,|| a Bhoja was the son of Goháditya and the seventh ancestor in a direct line from a sovereign of the name of Kála Bhoja "a hero resplendent as the sun," who was followed after eight successive generations by a Sakti Kumára who flourished in the Samvat year 1034 (16th of Bysakha) = A. C. 978. Col. Tod assumes the first of these two to be identical with his second Bhoja. Now ascending from Sakti Kumára if we allow eighteen years to each reign,¶ Kála Bhoja would be placed in the middle of the 9th century (A. C. 834) and Bhoja in the early part of the 8th century (A. C. 708) instead of the middle of the seventh agreeably to the Jain date. This discrepancy, however, may be reconciled if we allow the first Bhoja a reign of a little more than forty-three years from A. C. 665 to 708, or a little longer than an ordinary reign to one of his successors. It is probably this prince who is described as the elder or VRIDDHA BHOJA at whose instance Bána the poet propitiated the sun by a poem of great merit, the *Súryas'ataka*, and rid himself of leprosy; and it is possibly to him we owe the treatise on rhetoric entitled *Saraswati-kanthábharaṇa*

* Tod's Rajasthan, Vol. I. p. 800.

† Journal Asiatique, Mai 1844, p. 354.

‡ Description Historique et Géographique de l'Inde, Vol. I. p. 1.

§ Thomas's Prinsep, Vol. II. p. 250.

¶ Tod's History of Rajasthan, Vol. I. p. 802.

|| The genealogy of the fifteen princes of this line runs as follows: 1, Goháditya; 2, Bhoja; 3, Mahendra; 4, Nága; 5, Syeela, -(Sailya?) 6, Aparájita; 7, Mahendra; 8, Kála Bhoja; 9, Khoman; 10, Bhurtripada; 11, Singji; 12, Sa Ullut (whose daughter's son) 13, Nirvahanu; 14, Salivahanu; 15, Sakti Kumára.

and one or two other works which pass in the name of a Bhoja Rájá.* He was the contemporary of Mánatungas'uri and of Maura the poet. If he be admitted to have been the patron of Bána, it would require little proof to shew that he was a great patron of learned men and was surrounded by a number of poets and literati, and that without pledging our faith to the apocryphal five hundred scholars of his court. Our information, however, regarding Vriddha Bhoja is yet so meagre and unsatisfactory that it would be unwarrantable to assume, farther than as a mere conjecture, his identity with the second Bhoja of Col. Tod. The expression Vriddha (old) would suit the first Bhoja best, but the date of Bána would not justify the assignment. The Bhoja and Kála Bhoja of the Aitpura record have their counterparts in an inscription from Mount Abu noticed by Professor Wilson, but instead of being nine generations removed from each other, there they appear as father and son. Judging from this circumstance and the fact of the names of their ancestors for two generations and of their successors for twenty generations being different throughout, we have no hesitation in taking them to be quite distinct. They were Jains and belonged to the solar race of Mewar.† The last of the roll lived in A. C. 1286, which with the usual allowance of eighteen years to each reign would place Bhoja in the beginning of the tenth century (A. C. 908).

Kshiraswámin of Káshmir (A. C. 772) cites a Bhoja as the author of a vocabulary and a grammar;‡ but the editor of the Váśavadattá "does not feel it necessary to believe that in every instance Bhoja is the name of a king," and I am disposed to side with him.

The third Bhoja of Col. Tod's list is the hero of the *Bhoja-prabandha* and sovereign of Dhárá. Before I notice him it is necessary, for the sake of chronological order, to record the names of two sovereigns of Kanouj and one of Pehewa. The first two occur in a copper plate inscription§ found by the late Col. Stacy, a counterpart

* Colebrooke's *Miscellaneous Essays*, Vol. I. p. 22.

† *Asiatic Researches*, XVI. p. 291 et seq. The names are—1 Bappáka, 2 Gohila, 3 Bhoja, 4 Kála Bhoja, 5 Bhartribhāṭṭa, 6 Samahayika, 7 Khummāna, 8 Allata, 9 Naravāhana, 10 Sakti—? 11 Suchivarma, 12 Naravarma, 13 Kirtivarma, 14 Vairi Siñha, 15 Vijaya Siñha, 16 Ari Siñha, 17 Vikrama Siñha, 18 Samat Siñha, 19 Kumára Siñha, 20 Mathana Siñha, 21 Padma Siñha, 22 Jaita Siñha, 23 Teja Siñha, 24 Samara Siñha.

‡ Colebrooke's *Miscellaneous Essay*, Vol. II. p. 290.

§ Vide my translation of this record, ante, Vol. XVII. p. 71.

of which has lately been found by Mr. Cosserat at Sarun.* Col. Stacy's inscription bears date the 65 (?) of Vaishakha of a local era and records the grant of a village named Tikkarika which was situated on the left bank of the Ganges opposite Benares. The donor's name is Vináyakapála. His ancestors, who begin their genealogical tree with a Devas'akti, include a Bhoja son of Ramabhadra, and another son (?) of Mahendra Pála. In a paper entitled "Vestiges of three Royal Lines of Kányakubja or Kanouj,"† allusion has been made to a huge inscription at Gwalior which has the name of a Mahendra Pála with the date 960 close by it, then a Bhoja, and then again a Mahendra Pála with the date 964 after it; but as the transcript from which this information has been gleaned is described to be "full of breaks, the very perfection of all that is unintelligible, and the result of laborious infidelity in which the copyist had in patches by the dozen altered as many as eight or ten consecutive letters," I do not feel that it would at all subserve the purposes of history to attach any importance to these dates, until an authentic transcript of the record is available for reference. Colonel Cunningham probably refers to this monument in his letter of the 30th September, 1860 (Ante XXIX. p. 395), in which he makes mention of a Mahárajá Bhoja Deva in Gwalior. If my reading of the date of the Sarun plate, which I offer as a mere conjecture, be correct, the dates of Devas'akti's descendants at eighteen years per reign would be

1 Devas'akti,	A. C. 779
2 Vatsarája,	A. C. 791
3 Nágabhaṭṭa,	A. C. 814
4 Ramabhadra,	A. C. 832
5 Bhoja,	A. C. 850
6 Mahendra Pála,	A. C. 868
7 Bhoja,	A. C. 885
8 Vináyaka Pála,	A. C. 900

Should the data upon which my dates are founded be not deemed satisfactory, and the dates therefore not acceptable, still the Bhojas of Devas'akti's dynasty will not be confounded with the great sovereign of Dhárá. When Professor Wilson wrote his paper on the history of Káshmir, he knew of only one Bhoja between the tenth

* My note on this record was read before a meeting of the Asiatic Society held on the 2nd of July, 1862. It is likely to be published in the volume for this year.

† Ante, Vol. XXXI. p. 6.

and the eleventh centuries, and he accordingly made Sañkaravarma of Kashmir in the beginning of the tenth century (904 to 920) subvert the extensive empire of the sovereign of Dhárá, and solved the anachronism which this involved by stating that "we need not expect, however, extreme accuracy in this matter, and may rest satisfied with considering it as an approximation to the truth and generally as an additional testimony of Bhoja's having flourished early in the tenth century." Had he the Stacy record before him he would have found two names of an era which would have completely obviated his anachronism.

The second of these princes I ~~ass~~sume to have been identical with the sovereign named in an inscription on a Vaishnavite temple at Gwalior. He is described as a "Lord paramount" who flourished in A. C. 876. His genealogy is not given, but the date of his reign and the fact that the sovereigns of Kanouj about that time did exercise paramount power over Gwalior, justify the assumption.*

The Bhoja of Pehewa occurs in an inscription recorded on the side of a temple in a village on the banks of the Saraswatí fifteen miles west of Thaneshwar.† The record is very imperfect, having many lacunæ and large breaks at the beginning and end of every line, but from what remains a list of ten names have been made out as follows :

I. Mahendra Pala.

II. Jaṭula.

III. ? (illegible).

IV. Vajraṭa.

V. Yájnika.

VI. Sogga.

VII. Purna.

VIII. Devarája.

IX. Rámachandra.

X. Bhoja.

The date of the last on the inscription is unmistakably Samvat 279. The facsimile where it is given, happens to be perfectly clear, and the letters are so well formed that there cannot be the possibility of a mistake in the reading. But the circumstance of a Bhoja at so early a date misled me as to his identity, and those who have since attempted to correct me have been equally misled. Col. Alexander

* *Verities of the Kings of Gwalior*, ante Vol. XXXI. p. 397.

† *Verities of the Kings of Gwalior*, ante Vol. XXII. p. 673.

Cunningham, an authority of great eminence in all matters connected with Indian antiquities, was the first who noticed my mistake, but by taking a misprint in my paper in which 179 is, in one place, put for 279, he was led to suppose that a small cypher after the first figure had escaped me and the date was really 1079. The actual date being 279 a cypher after the first figure would give us Samvat 2079, which would carry us nearly a hundred and sixty years into futurity. The Colonel, however, subsequently changed his opinion as regards the cypher and said "the inscription is beyond all doubt, a middle age one, that is, the forms of the letters are those of the eleventh and twelfth centuries; I read the date 1190 S. or 1133 A. D."* Mr. E Thomas entirely concurred in this reading, and the learned Professor Weber, in the *Zeitschrift* of the German Oriental Society,† in commenting upon my paper, supposed with Col. Cunningham that either I must have overlooked a cypher after the first figure which he imagined existed and that the date was 1079, or the era used was other than that of the Samvat of Vikramāditya. None of my critics thought it worth his while to look to the genealogy of the prince named. It may appear strange that such distin-

* Ante, Vol. XXIV. p. 243.

† Vol. IX. p. 629. I translate the Professor's remarks for easy reference. "A very fragmentary inscription, bearing date Babu Rajendra Lal, in the face of the doubts hitherto entertained on this subject, draws hence the bold conclusion, that Bhoja lived A. C. 122 (he reads here Samvat 179; but the text, p. 676 has 279). As unfortunately no facsimile has been added (a great mistake, the writing alone furnishing the safest starting point) we think ourselves justified to doubt the correctness of the reading, which, even as it stands, fluctuates between 179 and 279. The time of Bhoja, however, by Lassen's excellent examination (*Zeitschrift der Kunde des M.* VII, 345) of the Nagpore inscription (J. Bombay B. of the R. A. S. 1,254) has been clearly defined, viz. the close of the eleventh and the commencement of the twelfth Samvat century. The special supposition of Lassen, that the 55½ years of his reign, as given by tradition, fall between Samvat 1093-1149 (A. D. 1037-1093) is chiefly based on the year of the death of one of his successors, viz. of Naravarmadeva, which Colebrooke (*Misc. Ess.* II, 298 303) fixed at Samvat 1190, as according to one inscription the anniversary of his funeral rites took place Samvat 1191, (mahārājas'rinaravarmadeva samvatsarika). From these words, however, only this follows, that he must necessarily have died at the latest Samvat 1190, but this does not exclude the possibility of his having died several years before. With reference to our inscription there is only one alternative, either the reading is 1079 (the small circle of the zero could easily escape observation), or, however improbable, the Samvat calculation differ here from the common one. In the first case, which I would approve of, Bhoja would have reigned already 1079 (A. D. 1023), and this being correct, Tod's conjecture, that the temporary expulsion of Bhoja, mentioned by tradition, was perhaps connected with the inroad of Mahmud of Ghuzni, who conquered Guzerat in the year 1024-26,—a conjecture which was attacked by Lassen,—would have been corroborated."

guished antiquarians as Col. Cunningham and the Professor Weber, to whom oriental scholars are so deeply indebted for their varied and most interesting researches into the past history of India, should, from a mere identity of names, infer the identity of persons, and yet the extracts quoted above shew that both of them found the name of a Bhoja in the monument under notice and per saltum came to the conclusion that it was that of Dhára, overlooking altogether that the last prince was the son of Sindhula and grandson of Sindhu,* whereas the potentate named in the record before them was the son of Rámachandra and grandson of Devarája. One of the Kanauj Bhojas was the son of a Rámabhadra,† but there is nothing to shew that Rámabhadra was an alias of Rámachandra, and their ancestors are quite different. Leaving aside, therefore, the question of date, the reading of which has been doubted, the bare fact of the two princes being descended from separate parents ought to leave no doubt of their having been different individuals, born, all but positively, at different periods.

As to the date of the potentate named in the Thanoswar record, the facsimile now published will shew as clearly as possible that it is 279 Samvat. If I assume with my critics that a cypher after the first figure has been overlooked or accidentally omitted by the engraver, a circumstance not very likely and yet not quite impossible, for engravers are liable to err, though not quite so often as copyists, the date will be 2079 which will carry the era of the prince, as aforesaid, nearly a hundred and sixty years into futurity. To assume a 1 before the first figure, would be a guess at random which can claim no confidence. The writer in the Zeitschrift quoted above, suggests the possibility of the Samvat alluded to in the record, being other than that of Vikramáditya; but we know of no Samvat which can be adopted with perfect propriety. Next to the era of Vikrama, the Samvat of Ballabhi was the best known in Malwa, and its zero being 318 A. C.‡ our date would be $318 + 279 =$ A. C. 597, which would be too early for the style of the characters in which the record is incised. The Samvat of the Sena Rajas of Bengal§ commenced in

* Madhukarghar inscription, Transact. Royal Asiatic Society, London, Vol.

I. p.

† Ante, Vol. xvii. pt. I. p. 72.

‡ Thomas's Prinsep, Vol. II. p. 158.

§ Ditto do. p. 272.

the year 1063 A. C. which, if assumed to be the era of the inscription, would place our Bhoja at the end of the thirteenth century when Thaneshwar and its neighbourhood were entirely in the hands of the Mahomedans. The same may be said of the Sivasinhā Samvat* of the Gohils of Deo the zero of which corresponds with 1112 A. C. No other Samvat era is known to have been current, unless it be purely a local or a family era, which is very likely, but in that case there is no easy prospect of our coming to a solution of the difficulty. A Bhoja Deva was king of Lodorvat in 1160 A. C. who would have nearly corresponded with the prince of Pehewa by assuming the first figure of our date to be 1 and the reading the second figure to be also 1 and not 2, thereby making the whole 1179 Samvat as supposed by Col. Cunningham, but unfortunately he was the son of Berjrae and not of Rámachandra. The same genealogical difficulty prevents our identifying him with the Rao Bhoja of Harouti, who was the son of Soorjun, and a contemporary of Akbar† (A. C. 1575).

The style of writing is generally appealed to as a chronological guide in cases where the reading of the date is doubtful. This undoubtedly is a good test to some extent; but Dr. Weber carries it too far when he assumes that in a case where the date fluctuates between 179 and 279 the style of writing may be allowed to settle the difference. This can scarcely be the case, except in very modern writings and at certain turning points; and even then it takes a much longer time than a century for one peculiar style of writing to pass so markedly into another as to afford a conclusive evidence of age; and this without advertent to local and individual peculiarities which so materially affect its uniformity. Nothing is more common than a single style of writing spreading over two or three centuries, or predominating in certain regions while it is dying out in others. The history of the Roman character in different parts of Europe during the last century affords a singular instance in point. James Prinsep, who was the first to devise a system of palæographic chronology for India‡ in which the style of writing was taken as an index to the age of the document in which it was found, was fully sensible of the fact, and he accordingly assigned a range of three centuries to his No. I. or Lat cha-

* Thomas's Prinsep, Vol. II. p. 158.

† Tod's Rajasthan, Vol. II. p. 242.

‡ Tod's Rajasthan, Vol. II. p. 475.

Ante, Vol. VII. p. 276, plate XIII.

racters, and of four centuries to No. IV. of the Guzerat plates. He could not intend his table to be other than tentative and open to considerable corrections and modifications, for it is impossible to believe that with the limited data before him in regard to a subject which had never, before his time, had the benefit of any scientific enquiry, he could be so far satisfied as authoritatively to lay down each particular set of characters to one well defined period which would not admit of either extension or contraction. The so-called kuṭiḷa or the "crooked" characters which, according to Col. Cunningham, owes its name to a mislection of the word *kumuda* or the "lotus like," was marked by Mr. Prinsep against the tenth century; but he did not by any means intend that it should be confined to that century alone, for he had himself translated several records of the eleventh century in that character. I have since noticed an inscription from Buddha Gayá* in which the Kuṭiḷa is associated with the Samvat date 781 = A. C. 726. This would give a range of four centuries, but as it is not to be supposed that the Kuṭiḷa had just been formed when it was used in the Buddha Gya monument, we may fairly give it an additional fifty, eighty or even a hundred years. No doubt there are peculiarities of certain forms and archaisms which to a practised eye distinguish the earlier from the later Kuṭiḷa, but they are of no value whatever in cases where the difference is not greater than a century. The character of the Thanewar monument is the Kuṭiḷa without any marked archaisms or tendency to merge into the modern Devanágari, and judging from it, one may be fully justified in placing it in the ninth, tenth or eleventh century according to his choice. The archaic character of some of the names Jaṭula, Vajraṭa, &c., would carry us to the earliest period of the Kuṭiḷa range, but under no circumstance to the third century of the Vikramáditya era, to which the date would bring us.

The discrepancy between the date and the style of writing, therefore, can be solved only by supposing, as I have already said, the Samvat of the date to be a local or family era utterly unconnected with Vikramáditya; and if this be admitted, our prince will be left to occupy a place in the Kuṭiḷa period which, until future research settles it more definitely, must enjoy a range of near three centuries.

* Ante, Vol. XXVII. p. 74.

The last sovereign on our list is the great Bhoja of Dhára.* According to the legendary accounts of the *Bhoja-Pravandha*, the *Bhoja-Champu* and the *Bhoja-Charita*, he was the son of Sindhula, the grandson of Sindhu and the immediate successor of Munja. His country, Málava, was an ancient and renowned seat of learning, and his people were noted for their refined manners and high civilization. Hiouen-Thsang, who visited the place in the seventh century, says "les habitants des province sont d'un caractère douz et poli, et ils aiment et estiment la culture des lettres. Dans les cinq parties de l'Inde, * * * ce pays et celui de Magadha, sont les deux seuls royaumes dont les habitants se fassent remarquer par l'amour de l'étude, l'estime pour la vertu, la facilité de l'élocution et l'harmonie du langage."† Kalidasa, on a much earlier date, sang of its glories in more than one of his immortal works.

Munja, according to Ballála‡ the author of the *Bhoja-Pravandha*, was the younger brother of Sindhula who bestowed the kingdom upon him in supercession of his son who was then only five years old, and utterly incompetent to assume the cares of state. The *Bhoja-Charita* contradicts this statement and makes Munja a founding who was brought home by Sindhu to be nursed by his wife Padmavatí. Sindhu, says the fabler, was out on a hunting expedition, and when alone on the bank of a river found on a tuft of Munja grass, (*Saccharum munja*, Rox.) a new-born babe, which he brought home and reared up under the name of Munja. The two biographers agree in giving Bhoja a long and prosperous reign of fifty-five years, seven months and three days, interrupted only for a short period when a *jogi* or mendicant, under pretence of teaching him the art of transferring one's soul from one body to another, sent the king's soul to animate the body of a parrot and himself entered the king's body and reigned in his stead. An accident enabled Bhoja, through the intervention of Chandrasena of Chandrávatí, to regain his mortal coil from the usurper, and he died a natural death, leaving his kingdom to his adopted son Gajánanda.§ The latter was childless, and with

* The *Rája-mártanda* gives Ranarangamalla as an *alias* of this Bhoja.

† Histoire de la vie et des voyages de Hiouen-Thsang, p. 204.

‡ Vallabha Pundit according to same MSS. His time has been supposed to have been A. C. 1340. Mons. M. Pavie has published a translation of this work in the Journal Asiatique for March, April, 1841, p. 184, *et seq.*

§ The name has been differently given in different places.

him, therefore, ended the glory of the Pramára race at Dhárá. Chaitan Pála, a great zemindar of the Tuar lineage, was elected the successor of Gájánanda, and his descendants reigned in Dhárá for 214 years.

With the exception of the period of Bhoja's reign the whole of these statements have been questioned. The story of Munja's birth is purely mythical, designed more to account for the origin of his uncommon name than to narrate sober facts. Professor Lassen* is of opinion that Munja was really the uncle of Bhoja, and that he came to the throne by usurpation when his brother Sindhula, or whatever else was his name, was away from his capital on an expedition to the South. This may be to some extent inferred from the story which says that once when an astrologer foretold that Munja would take the kingdom from his brother, Sindhula ordered Munja to be beheaded and subsequently, repenting of his rash command, made his sceptre over to him, and retired to the South to found a kingdom of his own. The story of the *jogi* and his metempsychosis may likewise be set down to pure invention, or a poetical euphyism for either a revolt at home or an invasion from the north which compelled Bhoja to fly from his kingdom for a time; and the accounts of his death and successors have been controverted by the testimony of authentic inscriptions recorded by his descendants.

The parentage of Bhoja, as given by his biographers, has the support of an inscription found by Col. Tod at Madhukarghar in Harouti,† but it differs from the biographers in giving the succession of Bhoja to a relative, Udayáditya, whose descendants occupied the throne of Dhárá for several generations.

A second inscription from a temple on the west bank of the Weyne Gangá near Nagpur, decyphered by Pandit Ball Gungadhur Shástri of Bombay,‡ gives a different genealogy. According to it, the founder of Bhoja's family was a Vairisiñha of the Pramára race, who was followed by his son Bhimaka. Bhimaka was succeeded by Rájá Rájá or Bhoja Rájá, and he by his younger brother Bhadra Rájá. Bhadra was the father of Bhoja Rájá, and Bhoja left the kingdom to his son Udayáditya, whose son Naravarmadeva recorded the inscription. To

* Zeitschrift für die Kunde des Morgenlandes, Vol. VII. p. 345.

† Transact. Rl. As. Soc. Vol. I. p. 226. It records the names of Sindhu, Sindhula, Bhoja, Udayáditya and Naravarma.

‡ Journal Bombay B. E. A. Society, No. VI. p. 259.

reconcile this statement with that of the Madhukarghar monument was found impracticable, and it was accordingly suggested that the latter may be cast overboard as well as the *Bhoja-Pravandha* and the *Bhoja-Charita*, inasmuch as we possess but a very imperfect paraphrase of it, and that prepared by an untrustworthy interpreter. The interpretation of the Nagpur record, however, has since been found to be even more untrustworthy than the paraphrase of Col. Tod's pandits, and its roll of names to be in more than one instance quite illusory. This was pointed out by Professor Christianus Lassen in his notice of a copper-plate inscription brought from Sattara and decyphered by him.*

The legend of the copper plate is, allowance being made for the Shástri's errors, an exact counterpart of the stone tablet at Nagpur, and hence it has been supposed that the plate had been originally deposited in the same temple upon the portico of which the stone is affixed, and that it was subsequently removed to Sattara, most probably, by the Marhattas, though the when and the why cannot now be satisfactorily ascertained. No facsimile of the document has yet been published, but from the satisfactory state of preservation of the original and the scrupulous care with which the Professor has examined it letter by letter, there can be no question as to its authenticity or of the general accuracy of its interpretation.

It opens with a salutation to Saraswatí, and after recounting the origin of the Pramára race, states that in it was born a king of the name of Vairisiñha, "who ruled the earth, shaming Indra in heaven by his prosperity." His son and successor Siyaka had two children, Munja and Siñharája, of whom Munja the eldest succeeded his father. How Munja died, the record explains not, but after describing the might and heroism of his brother Siñharája, makes his son Bhoja Rájá assume the sovereignty. This Bhoja† is no doubt the great king of the *Bhoja-Prabandha*, but his panegyrist has nothing to record of him besides a few unmeaning platitudes about great victories, unrivalled heroism, and so forth. No mention whatever is made of his "nine gems," nor of the encouragement he offered to

* Zeitschrift für die Kunde des Morgenlandes, Vol. VII. p. 194.

† The Bediyas or Gypsies of India hold a Bhoja to be the founder of necromancy and jugglery, and the Bengali romance, Bhánumatí, supports the idea. The common name of conjuration in Bengali is Bhojabáji or the feats of Bhoja, but no mention of it has been met with in any Sanskrit work.

learning and learned men, although the *Bhoja-Prabandha* devotes three-fourths of its space to recounting the names of the several poets who graced his court and to choice selections from their compositions, and it is all but certain that the *Rājamārtanda* and the commentary on the Yoga aphorisms which pass in the name of a Bhoja, owe their origin to his patronage. On the death of Bhoja, the country, says the inscription, was overrun by enemies, and anarchy everywhere reigned supreme, until at last a kinsman (Bandhu)* of the name of Udayāditya assumed the sovereignty and brought peace and prosperity in his train. Lakshmadeva the son of Udayāditya was a mighty prince. He stretched his arms over all India, and his conquests, says the chronicler, extended from Gour in the east to Balkh beyond Afghanistan, and from Mainak on the Himālaya, to Ceylon in the south; the countries especially named being Gour, Aṅga, Kaliṅga, Tripura, Chola, Pāndya, Ceylon, Maināk, and Balkh on the Oxus. Much of this no doubt is attributable to poetical hyperbole, for it is not at all likely that Lakshmadhara, a mere duke as he was, did wage war against Mādhava Sena, the Vaidya king of Bengal, who erected pillars of victory even in Central India, or proceed so far as Cabul to give battle to the Gaznavides in their own country. The centre of northern India was at his time held by the Pālas of Kanauj and they were not likely to fall a prey to the rapacity of a vassal. His conquests in Chola, Pāndya and Tripura may be facts, but they must have been of an ephemeral character.

The Ujjayinī plates decyphered by Colebrooke,† makes no mention of Lakshmadeva, but carries the succession from Udayāditya successively to Naravarmadeva, Yasovarmadeva and the two sons of the last, namely, Jayavarmadeva and Lakshmīvarmadeva. The Sattara plates call Lakshmadeva, the brother of Naravarma, and assign to the latter sufficient power to commute a grant of two villages made by

* By a mistaken estimate of the first word in the following extract a writer in the Journal of the American Oriental Society has been led to call Udayāditya the son of Bhoja.

ततोऽभ्युदयादित्यो नित्योत्साहिकौतुकी ।

असाधारणवीरश्रीरश्मिरेतुविरोधिनाम् ॥

J. A. O. S. Vol. II. p. 29—35, Vol. I. p. 517.

The Nagpur inscription has the word *Bandhu* though the decypherer read it *Madhava*. Probably the same cause led the interpreter of the Madhukarghar inscription to call him the son of Bhoja.

† Miscellaneous Essays, Vol. II. p. 297.

the former into one of one village, and make Lakshmadeva acknowledge it as a matter of course. It may hence be inferred that Naravarma was the immediate heir and successor of Udayáditya in Malwa, and that his brother held an appanage to the south of the Vindhya, having Nagpur for its capital. Probably he was a governor of the southern provinces during his father's lifetime and subsequently retained them for himself, in vassalage to his brother.* Professor Lassen supposes that he must have revolted against his brother, by whom he was overcome and expelled the country, and hence it is that he names Naravarma in the inscription without any praise. We think, however, that had such been the case, he would have scarcely thought it necessary to advert to the revocation of his grant by his brother in a document intended only to record the glories of his family, and his dedication of a temple to his god-elect.

But however that be, certain it is that he was a son of Bhoja's successor Udayáditya, and lived at the beginning of the twelfth century, and this being the case, the question arises, is the Bhoja of the Sattara inscription identical with the sovereign of that name noticed in the Madhukargarh record and the *Bhoja-Prabandha*? or is he different? The two last authorities concur in giving the same genealogy and evidently intend to describe the same prince. It is true the *Bhoja-Prabandha* names Munja, who does not appear on the Madhukargarh tablet, but as the object of the latter was only to give the lineal ancestors of Bhoja Rájá, the omission is not a matter of any consequence, inasmuch as Munja was only an uncle of Bhoja, and could not therefore be included among his direct ancestors. The Sattara and the Nagpur inscriptions name Munja as the immediate predecessor of Bhoja, and therefore may be supposed to allude to the hero of the *Bhoja-Prabandha*, but it makes Munja the son of Siyaka and Bhoja that of Siñharája. This discrepancy is farther confounded by an inscription from Ujjayini decyphered by me in 1850,† and another found at Indore and published in the last volume of the Journal,‡ both of which make a Krishnarája to be the first of a line

* Zeitschrift für die Kunde des Morgenlandes, Vol. II. p. 340.

† Ante XIX. p. 475. The conjecture thrown out there regarding the succession of Váskpati is untenable.

‡ Ante XXX. p. 195. Mr. Hall, with his wonted predilection for microscopic criticism, complains in this paper, as elsewhere, of Colebrooke's imperfect translations of the imprecatory verses in the record, and supplies now verbatim some under the apology of more than one of their number having been "repeated."

of kings of Malwa, the second of which was a Vairisiñha, the third a Siyaka, and the fourth Vákpatirája *alias* Amoghavarsha, *alias* Vallabhanarendra. The last made a grant of land at Ujjayiní in the year of Samvat 1031 = A. C. 974, and subsequently another in Samvat 1036 = A. C. 980, just when, according to the Sattara record, the capital of Malwa must have been in the hands of Munja or his immediate predecessor. Here, it is true, we have the Vairisiñha of the Sattara plate, but his son Siyaka is followed not by Munja but Vákpatirája whose alternative names were Amoghavarsha and Vallabhanarendra. To solve this difficulty, it has been suggested that the Siyaka of the Sattara, Ujjayiní and Indore plates is but an *alias* of the Sindhuvá of the Madhukargarh monument and the *Bhoja Prabandha*, and that Munja is but a nickname of Vákpati *alias* Amoghavarsha; Sindhuvá being the *alter ego* of Siñharája. It must readily be admitted that there is little to justify these assumptions, and it is hard to conceive that grave monumental records and title-deeds of real property should so name the same individuals as not be recognisable without assuming far-fetched aliases, and yet the identity of time and place mentioned, leaves us no alternative. The Krishnarája of the Indore and Ujjayiní plates could not reign at the last named place simultaneously with the descendants of the Vairisiñha of the Sattara plates, and we must therefore either admit that they were identical, or assume one of the two lines of kings to be mythical. The last is impossible, as we have to deal with donative records of undoubted authenticity.

That those records allude to the same time it is not difficult to shew. The Sattara inscription of Lakshmadeva bears date 1161 Samvat = A. C. 1104. His brother Naravarma was succeeded in Malwa by his son Yasovarma who celebrated the anniversary of his father's death on the 8th of the waxing moon in the month of Kártika S. 1191 (A. C. 1135) by the donation of two villages to a Brahman of some sanctity. This grant was subsequently ratified by his son Jayavarma on the 15th of the waxing moon in the month of Srávana S. 1200 = 16th July, A. C.

edly misinterpreted;" but unfortunately for his predecessors he frequently misinterprets where they were correct. One notable instance of this occurs on page 210 where "unsteady as a drop of water on a lotus leaf" of Colebrooke having been converted into "uncertain as a bead of water on the petal of a lotus," the idea of unsteadiness has been entirely lost; since it is only on the leaf of the lotus that water is tremulous and not on its petals.

1144.* Colebrooke supposed that Naravarma must have died in Samvat 1190, or otherwise his son could not celebrate the anniversary of his funeral in the year following. This, however, is not necessarily the case; for the *sámvatsarika* or anniversary *shráddha* is an observance which recurs every year, and therefore allusion to it implies any time beyond eleven lunisolar months and twenty-nine days; no matter whether it be one or many years.† Allowing for this uncertainty a range of only ten years, this much may be taken for granted that Naravarma died between 1180 and 1190 Samvat. Now if we allow him a reign of twenty-five years and a short one of fifteen to his father Udayáditya, the close of Bhoja's reign will be placed between 1140 and 1150 S. = A. C. 1083 to 1093, and the commencement of it at about the beginning of the eleventh century. It has been already assumed on the strength of Vákpati's making grants of land in the neighbourhood of Ujjayini that he held sovereign power in that capital and the province in which it was situated, in the year of Vikrama 1036 = A. C. 980, and if we may attach any importance to their ultra-regal titles, his predecessors for three generations were anointed kings, who most probably, though not necessarily, did reign at the same place immediately before him. Consequently it must follow that either Vairisiñha and his successors of the Sattara plate, including Siyaka, Munja and Bhoja, flourished after Vákpati and within 980 to 1083 A. C., or the latter was identical with Munja. The first alternative would give a century for four reigns and that on the supposition that Vákpati died immediately after the grant named above, while we have the authority of the *Kumárapála Charita* to shew that Munja was alive in 1079 Samvat = A. C. 1020, when Durlabha visited him on his pilgrimage,‡ and that of tradition, the *Bhoja Charita* and the *Bhoja Pravandha* to assign to Bhoja a reign of fifty-five years, seven months and three days, which leaves only six years unaccounted for, and to be disposed of either by assignment to Munja or Udayáditya. Professor Lassen has accepted the traditionary reign of Bhoja, and I feel fully dis-

* Colebrooke's Misc. Essays, II. p. 299.

† Wilson, Lassen and others have adopted the interpretation of Colebrooke, but the practice of the *sámvatsarikáśráddha* is so strictly observed in the present day, that I make no hesitation in rejecting it, and in so doing I am glad to find I have the support of Professor Weber.

‡ Lassen's Zeitschrift, Vol. VII. p. 220.

posed to acquiesce in it inasmuch as it would be impossible to account for his wide-spread fame over all India without allowing him a long and prosperous rule.

It is possible that some persons may be disposed to divide Malwa into two principalities, assigning one with Ujjayiní for its capital to the line of Vákpati, and the other with Dhárá for its metropolis, to the house of Munja. But this would not be in keeping with the known fact of the successors of Bhoja having owned the whole of Malwa and a good deal beyond it for their dominion, and they were avowedly sovereigns of much less renown and acquisitive tendency than their ancestors; not to advert to the rather improbable fact of Dhárá and Ujjayiní, having each a Siyaka and a Vairisiñha at the same time.

A not very weighty objection to this identification of the two Vairisiñhas and Siyakas arises from the tenor of one of the land grants of Vákpati which was ratified by a Rudráditya and which consequently implies his vassalage or subordination to him. A second grant of his, however, which is four years earlier, was issued without any ratification and under the authoritative declaration, "by my own order" स्वयं आज्ञादायकः. Besides the princes of Central India and indeed of India generally, held their power under such uncertain tenure and within such circumscribed areas that their independence and vassalage were matters of frequent recurrence and they cannot be used as arguments against their consecutive reigns in their own dominions. At any rate should the reign of Vákpati and his predecessors in Malwa be on this account doubted, still the relationship of Bhoja cannot for that reason suffer, while the dates of his successors leave no doubt as to his era.

Those dates have been verified; first, by the inscriptions from Sattara and Nagpur which place Lakshmadeva and Naravarma in 1161 S. = 1104; second, by three inscriptions from Ujjayiní, one of which gives the dates of Yasovarma (1191 S. = A. C. 1137), and the other of his son Lakshmivarma (1200 S. = A. C. 1143); and third, by an inscription from Piplianagar* which places Arjunavarma the great grandson of Yasovarma in S. 1272 = A. C. 1211—1215, and the statement of which has since been verified by a copper-plate

* Ante, Vol. VII. p. 726.

from Sehore bearing the same date.* These leave no doubt as to Bhoja's reign having closed between 1083 to 1093 of the Christian era, and taking the traditionary period of his reign to be correct, his accession to the throne of Dhárá would be placed in the year 1026. This would give a reign of near fifty years to Vákpati *alias* Munja, which under ordinary circumstances cannot but raise our suspicion, but with the date before us we must accept it as a fact until otherwise settled by future enquiry.

A stone inscription from Bhera Ghat on the Nurbudda† calls Alhanádeví, the queen of Gayákarnadeva of Chedi, the granddaughter through her mother, of Udayáditya, and makes one of her sons, Narasiñha, reign in the year A. C. 907, another, Jayasiñha, in 928, and her great grandson, Ajayasiñha, a minor, in 932. This carries Udayáditya a century before Bhoja. The anachronism, however, may be explained if we assume the Samvat of the inscription to be other than that of Vikrama, probably of Vallabhi, though it is doubtful if that era ever extended so far as Chedi.

Commenting on an inscription from Oodeypur near Sagore, Mr. Torrens‡ was led to assign Udayáditya to the seventh century, and Lassen adopting that assignment made it correspond with the date given in the Ayín Akbery. But the transcript of the document as decyphered by Kamalákánta is so full of lacunæ and so imperfect with all, that it has no claims whatever to any consideration. The Udayáditya era supposed to be mentioned in it is simply the result of an illusion.

Bentley places the close of Bhoja's reign in the year of Christ 1082,§ which differs from our assignment by only a single year. Lassen's date is wider by ten years, owing to his having assumed the death of Naravarma to have taken place in 1190 and not a few years before it, as we assume to have been the case. The differences, however, are so slight that they cannot affect the general conclusion that Bhoja Pramára lived in the middle of the eleventh century, his reign spreading to within a few years of 1026 to 1083 of the Christian era.

* Journal American Oriental Society, Vol. VII. p. 24.

† *Idem*, Vol. VI. p. 499.

‡ Ante, Vol. IX. p. 545.

§ Asiatic Researches, Vol. VIII. p. 243.

Extracts from a report from Major J. T. WALKER, Engineers, Officiating Superintendent, Great Trigonometrical Survey, to the Secretary to Government of India, Military Department.

Dated Dehra Dhoon, 25th August, 1862.

SIR,—I have the honor to narrate the progress made in the course of the operations of the Trigonometrical Survey, since its late Superintendent, Sir Andrew Waugh, submitted his last Tabular Progress Report, with his No. 13,115, dated 31st January, 1861, to your office.

* * * *

3. The operations in Kashmir under the superintendence of Captain Montgomerie have made good progress, notwithstanding the increasing difficulties which have had to be encountered as the work progressed, and entered higher and more inhospitable ground. In the year 1861 the triangulation was extended over an area of more than 12,000 square miles, including some very elevated and difficult country in Zaskar, Rukshu, the Upper Indus, and in Khagan and Nubra. At several points it was carried up to the Chinese boundary, and stations were visited in the neighbourhood of the Parang and Baralacha passes, where a junction of secondary points was formed with the North West Himalaya series, the basis of the degree sheets recently published in Calcutta by the Surveyor General. The stations in Ladak and on the Upper Indus were very high, generally over 17,000 feet. Mr. Johnson took observations at one station more than 20,600 feet high, the greatest altitude yet attained as a station of observation. Several remarkable peaks Trans Indus, probably forming the watershed between the Chitral and Swat valleys, were fixed from the stations West of Khagan.

4. The topography embraces an area of about 14,500 square miles, executed on the scale of 4 miles to the inch, leaving but a very small portion of Little Thibet unfinished, and completing the greater portion of Nubra, Ladak, Rupshu, (or Rukshu) and Zaskar. Several of the Salt Lakes on the table-land of Rukshu have been surveyed. Some exceedingly difficult ground was sketched by Captain Austen in Little Thibet, varying in altitude from 7000 to 28,300 feet above the sea. The glaciers he has discovered and surveyed are

probably the largest in the world out of the Arctic regions, the Baltoro Glacier, in the Braldo branch of the Shigar valley, being no less than 36 miles long. The Biafoganse is nearly as long, and forms, with the glacier on the Nuggair side, a continuous mass of ice nearly 64 miles in length. To delineate them properly a great amount of roughing and exertion, and not a little danger, had to be undergone by Captain Austen, as it was necessary for him to encamp on them for days, and to ascend to great heights on either side.

5. The carrying out of these interesting operations has involved vast labour and exposure. The country was found to be barren and desolate in the extreme, and the weather very unfavorable, in consequence of the extraordinarily heavy rains, for which the year will probably be long remembered. Contrary to their wont the clouds crossed over the south of the Himalayas to the northern side, bringing heavy falls of snow in August, and generally hindering the work. Supplies and firewood had to be carried great distances, argols of yak dung being often the only fuel available. Under these circumstances, the outturn of work is most creditable to the officer in charge and his assistants. Captain Montgomerie testifies to the zeal and cheerfulness with which all under his orders have executed the difficult tasks assigned to them. He also acknowledges the cordial assistance which the members of the Survey have invariably received from the Maharajah of Kashmir and his higher officials.

6. The Kashmir party being employed in mountains which are only accessible during the summer months, its field season is the period of recess of the Trigonometrical parties employed in ordinary districts. The usual survey year commences in October, by which month the computations and maps of the preceding field season are generally brought up, and the party is ready to take the field again. The Kashmir survey year is exceptional and commences in March. The officers in charge of the various parties submit their respective annual reports on the termination of the field operations, which are the real test of the advance made during the year. Thus the Superintendent of the department cannot prepare progress reports for strictly synchronous periods. Sir Andrew Waugh's last report embraced the summer of 1860, and the preceding winter. The present narrative embraces the summer of 1861, and the winters of 1860-61 and 1861-62, and consequently gives the progress which has been

made in two successive field seasons of ordinary triangulation and one season of the Kashmir operations.

* * * * *

“Lieutenant Melville, commencing in the north of Zaskar (or Zaskar) surveyed a large portion of it, including all the large glaciers, to the west, as well as those, at the head of the Butnai river. Some of these glaciers were 15 to 7 miles in length. Total progress very good, and with the trigonometrical points now available he will be able to complete the sketch of Zaskar during the ensuing season. Whilst surveying, Lieutenant Melville made some very successful and characteristic photographs of glaciers, and of the country generally.’”

7. The COAST SERIES,* between Calcutta and Madras was placed under the superintendence of Captain Basevi, Bengal Engineers, in the autumn of 1860, the exigencies of the department having required his transfer from the Trans-Indus frontier all the way to the Madras Coast.—His operations commenced in the vicinity of Vizagapatam, and were proceeding towards Rajahmundry, when on approaching the hill of Kapa in the Rampa estate, he found that his signallers had been driven away from the hill with threats of violence, and that the inhabitants of the district were assembling to prevent him from ascending. The estate is rent free, and the people are a lawless set, though under the control of the Godaveri Magistracy. Captain Basevi, having obtained an extra Military Guard and a body of Police, made his way to the summit of the hill without molestation, and took the necessary observations. One day, the people set fire to the grass on the hill, which was about 8 feet high, and a Rajah brought intelligence that they were collecting to attack the Surveyors; but the fire was extinguished, and the attack was not attempted. Captain Basevi’s chief apprehensions were for the signallers, whom he had to leave behind at the station, but a guard was left with them, and they were unmolested. The only serious inconvenience occasioned was in having to construct the station on a block of laterite several feet below the hill, for the summit was covered with dense jungle

* On the Coast Series, the principal operations consist of 42 triangles, arranged so as to comprise one double and five single polygons, and one quadrilateral. Twenty-one triangles were measured during the first season with a 2-foot Theodolite by Barrow, giving a mean triangular error of $0''.65$, and an equal number measured the next season, with a similar instrument by Troughton and Simms, gave a mean error of $0''.37$.—Azimuthal observations on Circumpolar Stars were taken at three stations.

which there was no means of clearing away without the assistance of the villagers, all of whom had absconded.

8. Fortunately, such interruptions are of rare occurrence, only happening in the unusually lawless districts around Hyderabad. The operations proceeded without further opposition or hindrance, excepting from the physical difficulties of the ground passed over.—The district between the Godavery and Kishna rivers was crossed, with considerable trouble, owing to the absence of high hills, and the undulating nature of the ground, which was all the more difficult because covered with dense jungle. Thus the selection of stations in such a manner as to form an unbroken chain of quadrilaterals and polygons, became a very tedious and laborious undertaking, involving the repeated rejection of positions which at first promised the requisite visibility in all directions, but were afterwards found to be deficient in some essential relation. Nevertheless, in the two field seasons the principal triangulation was carried a distance of upwards of 180 miles. It has now reached a point in the Guntoor district near the meridian of Madras, whence it will merge into the meridional arc which is intended to connect Jubbulpore and Madras, and to be extended southwards into Ceylon.

9. After completing his triangles thus far, Captain Basevi returned to Vizagapatam, to select a site for the base line of verification, which it is proposed to measure in this neighbourhood. He succeeded in obtaining a suitable site, but not until his field operations had been so long protracted that it was the middle of June before he could break up his camp and return to quarters. In the event of Captain Smyth's expedition into Central India taking place, Captain Basevi has been nominated to accompany it in the capacity of Astronomer and Topographer.

10. The INDUS SERIES, running parallel to the western frontier of British India, was completed by the close of the field season 1859-60, when the late Surveyor General decided on carrying an oblique series along the south east bank of the Sutlej, from Mitunkote to Ferozpour, to tie up the Punjab meridional series, and form a basis for future triangulation into the deserts of Sind and Rajpootana. Certain small portions of the Indus triangulation which had been executed with a two-foot theodolite gave unusually large re-entering errors. Lieutenants Herschel and Thuillier, both of the Bengal Engineers, and first As-

sistants of the Great Trigonometrical Survey, were consequently sent to revise them with the great theodolite, while Mr. Armstrong was selecting stations and building towers on the line of the Sutlej. Twenty-one principal triangles were ably and rapidly revised, after which Lieutenant Thuillier proceeded to join the Kashmir party while Lieutenant Herschel took in hand the Sutlej triangulation.* This consists of a series of single triangles, of which one flank rests on the sand hills fringing the Bahawalpore desert, and the other in the lowlands which are periodically inundated by the Sutlej. Thus the greater portion of the rays traverse moist jungles of tamarisk and long grass, alternating with ridges of sand, forming a combination which is peculiarly troublesome in disturbing the atmosphere,

* Lieutenant Herschel took astronomical observations for the direct determination of azimuth at 3 stations at an average distance of 72 miles apart. His mean triangular error is 0.53. In 85 angles his mean probability of error is 0.25 between extremes of 0.10 and 0.38. He has given the following interesting table as a test of the accuracy of his work.

(A)		Maximum difference between observations.									
Number	(B) of measures in a set.	0'' to 1''	1'' to 2''	2'' to 3''	3'' to 4''	4'' to 5''	5'' to 6''	6'' to 7''	7'' to 8''	8'' to 9''	Total.
	2	1	0	0	0	0	0	0	0	0	1
	3	223	251	93	0	0	0	0	0	0	567
	4	3	13	65	22	1	0	0	0	0	101
	5	0	5	4	29	13	1	0	0	0	52
	6	0	0	0	5	11	5	3	0	0	21
	7	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	1	1	1
	9	0	0	0	0	1	0	0	0	0	1
Total.		227	269	162	56	26	6	3	1	1	750

Total 0'' to 3'' = 658. Total greater than 3'' = 92.

In this Table the unit is a set of measures of an angle on a single Zero, the arguments being A, the maximum difference between the respective measures forming a set, and B the number of measures.

Lieutenant Herschel has introduced an improvement in the referring marks at present used in the survey. Instead of having two apertures one for a lamp, the other for a heliotrope, he made both lamp and heliotrope illuminate the same piece of ground glass, the aperture of which was limited by a circular diaphragm of diameter suitable to the distance. Thus one object is intersected instead of two, and there is no flickering or unsteadiness of signal from wind or imperfect direction of heliotrope; there is no dazzle from too bright a sun, nor total disappearance in its absence, for the mere reflection of the sky suffices to illuminate the glass in tolerably clear weather. One mile is considered the best distance for such a mark.

and causing lateral refraction to perplex and weary the observer, and impair his measures. The principal operations consist of 38 triangles, extending over a distance of 132 miles from a side of the Indus series below Mitunkote to the vicinity of Pak Puttun. Being entirely in the plains they cover an area of only 1,960 miles.

11. Lieutenant Herschel reports that "all the principal towns and villages along the line of the series have been fixed where practicable. They are necessarily few in number, as the country is more and more thinly populated from Ahmedpur eastwards as far as the British boundary. From Bahawulpore to Fazilka, the towns become fewer and of less importance, reaching a climax of insignificance in Bahawulgurh, the capital of nearly half the whole state, which is nothing but a hamlet without a single pukka house in it, and deriving its importance apparently from nothing but the prestige of an old ruined fort, and the residence in it of the temporary holder of the largest (but by no means the richest) Kardari in the states. The country is singularly poor in mosques, temples, tombs, or indeed prominent buildings of any kind."

12. The RAHOON MERIDIONAL SERIES,* under the charge of H. Keelan, Esq., first Assistant Great Trigonometrical Survey, has advanced a distance of 176 miles, by 33 principal triangles, arranged in quadrilaterals and hexagons, covering an area of 4,130 square miles. It has laid down the positions of Jeypoor, Ulwar, Deoli, Boondi and numerous other places of importance. In one more field season, it should reach the Longitudinal Series between Calcutta and Karachi, where it will terminate. The published Charts of the Kotah and Boondi territories indicate a succession of hills over which it was supposed that the triangulation might have been carried and completed last season. But the ground was found to be the very reverse of what had been expected, and to require the construction of towers, thereby protracting the operations into another season.

13. The GOORHAGURH MERIDIONAL SERIES,† under the charge of

* Mr. Keelan employed Colonel Waugh's 2-feet Theodolite No. 1, in his triangulation. The average error of his 33 triangles is $0''.36$. The mean probability of angular error is 0.30, between extremes of 0.12, and 0.55. Azimuth observations were taken at 3 stations. The secondary triangulation covers an area of 7,040 square miles.

† Mr. Shelverton employed Colonel Waugh's 2-feet Theodolite No. 2 in his triangulation. The average error of his 50 triangles is $0''.54$. The mean probability of angular error is 0.46 between extremes of 0.19 and 0.87. ~~Asimuth~~

George Shelverton, Esq., Civil second Assistant Great Trigonometrical Survey, traverses a meridian close to that of Umritsur, and was brought to a termination last season by joining the Arumlia Series, which had some years previously been carried, by Captain Rivers of the Bombay Engineers, up an adjacent meridian, as far as Ajmeer, from the Great Longitudinal triangulation. From Sirsa to Ajmeer it crosses a desert tract, of which Mr. Shelverton reports that "the main difficulties encountered were scarcity of water, of building material, of laborers and of provisions. The country traversed had suffered for three years from extreme drought; large villages, originally containing upwards of 500 families, had been deserted by all except first class farmers who were too proud to work. Wholesome water was scarcely procurable, and water even for building purposes had frequently to be conveyed from distances of 4 and 5 miles. The largest reservoirs of water upon which the inhabitants depended for their supply during the greater part of the year had invariably been exhausted, and the expensive kucha wells of the country barely sufficed for local wants. It was therefore under very adverse circumstances that the Goorhagurh Meridional Series was conducted during the field season of 1860-61."

14. During the following season the deserts of Bikaneer, Shekhawati and Marwar were extensively traversed, and a very large area of both principal and secondary triangulation was executed, reflecting much credit on Mr. Shelverton and his assistants, who skilfully and energetically availed themselves of the facilities offered by mounds and hills, commanding extensive prospects, to fix a large number of positions of importance. In the two seasons the triangulation was carried a direct distance of 342 miles by 50 consecutive triangles, covering an area of 4,454 square miles.

15. The ASSAM PARTY,* in charge of C. Lane, Esq., Chief Civil

observations were taken at only one station. The secondary triangulation covers an area of 10,954 square miles. Owing to the paucity of good natural or artificial objects, 152 secondary station marks were built for future reference.

* The area of Secondary Triangulation executed during both seasons is 10,250 square miles, fixing the positions of Silchar, Sylhet, Jyntiapoore and numerous other places of importance. One azimuth only was determined by astronomical observation.

Mr. Rossenrode reports as follows of the tribes who inhabit Independent Tipperah: "The Court of the Rajah at Agratolla is composed entirely of Bengalis. A Brahmin of Bengal has the sole management, and conducts the affairs of the state. Being a Brahmin he is also the spiritual adviser of the Rajah, who

Assistant, was employed in 1860-61, in triangulating along the Eastern Frontier, from the south of Gowhaty to Cherra Poonjee. Recent prohibitions regarding the impressment of coolies occasioned much embarrassment, notwithstanding that the majority of the Cossyabs are porters by trade; delay was thus caused in taking the field, and

pays him the greatest reverence and respect, and remains standing during any interview which may take place between them. The Praboo, as this Brahmin is called, is not very popular from having cut down the expenses of the Rajah, reduced his retinue, discharged many of his retainers, and sold the superfluous elephants and horses. He has done much good since the country has been under his management. A younger brother of the Rajah, Barchand Thakoor, resides at Agratolla. He has received the rudiments of an English education, and has been taught Chemistry, Medicine and Photography, and amuses himself with taking likenesses. He takes no part in business, and seems to have no influence whatever.

"The court being composed of Bengalis, none of these men were willing, or would volunteer their services when an agent was required, to accompany Mr. Ellison, and their reluctance to do so may be attributable to the difficulties they would have to encounter in an unexplored, uninhabited portion of the country through which Mr. Ellison pointed out to them on the map that the work would have to be conducted.

"On enquiry, Mr. Ellison learned that the country was uninhabited owing to the inroads of the Kachak Kookies, an independent tribe, who leave their hills and fastnesses in the interior, and make frequent forays, plundering and murdering the Tipperah Rajah's people. The great dread of this savage and inhuman tribe causes such a panic throughout this portion of the country, that all the inhabitants deserted their villages and settled on the Frontier, or in the Cachar, Sylhet and Comillah districts, and no persuasion will induce them to accompany a small detachment such as Mr. Ellison's was. With a large armed force able to repel any attack, these very people, formerly subjects of the Rajah of Tipperah, are ready to render every assistance, and to guide the force, in order that the Kachak Kookies may be severely punished, nay exterminated from the country.

"There are several tribes in Independent Tipperah. The Kookies, Nagas and Tipperahs inhabit the hills and jungles. They select a locality for their village, clear it and the surrounding hills and valleys, and cultivate the rich virgin soil for two, three, or at the utmost, four years, and then remove to some other equally favorable locality. They chiefly cultivate cotton, a fourth of which is given to the Rajah annually; a portion is spun and manufactured into coarse cloth for household use, and some pieces of cloth of better texture, as well as the surplus cotton, are taken to the nearest hâf, or market, and exchanged for goats, pigs, dogs, fowls or ornaments. They also cultivate rice, yams, and a gram termed chena, (which grows only on these hills,) for their own consumption. The Kookies and Nagas have no caste, they eat dogs and cats; in fact every animal and every bird is eaten. The Kookies of Assam, Cachar, Manipur and Tipperah have different dialects, and the same may be said of the language of the Nagas of the above-named places. The Tipperahs, in dress, appearance and habits, resemble the inhabitants of Assam. They have their own language and are a low caste of Hindus; from constant intercourse with the people of the plains they are more civilized, and understand Bengali. The Tipperahs are candid, straight-forward, cheerful, and of all the hill tribes met with on this side are most trustworthy and intelligent. The Kookies and Nagas are a sullen, morose, treacherous set, and cannot be conciliated or depended upon. They do not mix with their neighbours, and consequently retain their barbarism. The Kachar Kookies are an independent tribe, and nothing is known of them except that they make frequent incursions, rob, plunder and murder, the inhabitants."

often afterwards. Mr. Lane reports that it frequently proved of assistance, as a turning point to the arguments employed to persuade these loyal people to act as porters, to tell them they were required "on Her Majesty's Service," interpreted "Maharanee ka kam." The operations were further impeded by clouds and mists, and latterly by storms of such severity that on one occasion the whole of the Bunder Bazar, on the bank of the Soorma, was utterly destroyed and no vestige left. Final observations were taken for 19 principal triangles arranged in a double series, extending over a direct distance of 62 miles, and covering an area of 1,207 square miles. Eight important Snowy Peaks of the Bhotan Himalayas were fixed.

16. During 1861-62, Mr. Lane was absent on leave on medical certificate, when his place was ably filled by Mr. W. C. Rossenrode, who extended the triangulation a direct distance of 89 miles eastward through Cachar towards Munipoor, and 25 miles southward towards Independent Tipperah, in all 114 miles, by 30 triangles arranged in a double series covering an area of 2,024 square miles. Some of the stations were situated in the Jyntecapore district, but the observations at them were fortunately completed before the present rebellion broke out. Reciprocal observations had still to be taken to them from other stations around, necessitating the employment of Hindustani clahis to work the signals on them; the men though robbed and threatened, maintained their posts during the rebellion, and only came away when signalled to do so at the termination of the observations.

17. I have already reported that on learning that the Bengal Government had ordered a survey of Independent Tipperah to be made, I arranged with Mr. Buckland, the Commissioner of Chittagong, for our triangulation to be carried across Tipperah, on the direct line from Cherra Poonjee to Chittagong, instead of taking an extensive circuit westwards, as was originally contemplated, in order to keep within British Territory, and away from a frontier believed to be insecure. Mr. Ellison was deputed to enter Tipperah to reconnoitre the country, and select sites for the stations. He was considerably delayed by having to wait for the Rajah's Agents, but he made some progress, and is reported by Mr. Buckland to have "behaved with much tact and patience, although he had to encounter the usual obstructiveness of the Rajah and his people." Mr. Elli-

son has supplied some interesting information regarding the hill tribes inhabiting Independent Tipperah, which I have extracted from Mr. Rossenrode's report and given in the foot notes.

18. The BOMBAY PARTY,* under the superintendence of Lieutenant now Captain C. T. Haig, Bombay Engineers, 1st Assistant, was engaged in 1860-61, in completing the triangulation necessary to connect the Guzerat longitudinal series, on the parallel of 23° , with the Singi meridional series, which had been brought up from Bombay as far as Surat, by Captain Rivers, some years previously. The connexion was satisfactorily accomplished, notwithstanding that the section of the party employed in selecting stations, got entangled in some malarious jungles, where both Europeans and Natives were attacked with jungle fever, and had to retire to Broach until the sickly season was over. In 1861-62, the Guzerat longitudinal series was extended eastwards to the Khanpisura series on the meridian of 75° , and a series of triangles on the meridian of Oodipoor was carried between it and the Karachi longitudinal, thus completing the triangulation of the northern portion of the Bombay Presidency. The principal operations involve 125 miles of triangles arranged in a double series, and about 190 miles arranged singly, the total number of triangles being 42, covering an area of 7,450 square miles.

19. The LEVELLING OPERATIONS,† under Captain Branfill, of the

* Astronomical observations for azimuth were taken at two stations.

Of the Meridional Series, south of Oodipoor, Captain Haig reports as follows. "The country through which this series runs is inhabited by the wildest set of savages that I have as yet ever had to do with. The thieves (who form a portion of the inhabitants of every village) for the sake of the clothes a man has on his back, assault him; if he attempts to escape, they bring him down with a shower of arrows, utterly regardless of his life. On this account, communication by messengers was attended with great risk, and consequently Messrs. Dacosta and McGill were each unacquainted with the other's progress until they actually met, otherwise I had intended them to be in frequent communication. It is partly due to this that the Series has a bend in the centre, and partly because the Rajah of Saloomber, a very refractory chief, would not permit a Station to be built on his hills, although directed to do so by the Political Agent."

Mr. Dacosta was employed in carrying a Secondary Series of triangles along the west coast of the Gulf of Bombay, from the mouth of the Sabarmuthee river to Gogo, over a flat tract of country, which for a great portion of the year is entirely under water. Also in selecting principal stations for the Mangalore and Oodipoor Series, over a meridional distance of upwards of 180 miles. He laid out a Secondary Series down the east coast of the Gulf of Cambay as far as Surat, and carried other triangles to fix the position of Baroda.

† During the course of the levelling operations, it has often been noticed that though the independent results obtained at each station by the respective observers differ if at all by almost imperceptibly minute quantities, the differences have a tendency to go all one way, and have occasionally accumulated to large

late 5th Bengal European Cavalry, second Assistant, have made good progress, having in the two field seasons been carried from a point near Mitunkote, on the Indus line of levels, to the Dehra Dhoon Base Line, viâ Bahawalpoor, Ferozpoor, Loodiana, Umballa and Saharunpoor, and thence on to the Seronge Base line in Central India, viâ Meerut, Allygurh and Gwalior, over a distance of 999 miles. In the course of these operations, stone bench marks were fixed at distances of 12 to 15 miles, and the most substantial milestones met with by the road side were also determined, for future reference by Canal or other Engineers engaged in levelling operations. A satisfactory connexion has been made with the Ganges, and the eastern Jumna Canal levels, and with those of the Allahabad and Agra Railway, which are now capable of being reduced to the mean sea level as a common datum.

20. The COMPUTING OFFICE in Calcutta, under the superintendence of Baboo Radanath, chief computer, was engaged in completing the triplicate manuscript volumes of the General reports of the Parisnath, Hurilong and Chendwar Meridional Series, and in furnishing elements for the various Topographical and Revenue Survey Parties requiring them. In March last, Baboo Radanath retired on a pension, after 30 years' service, during which he had repeatedly earned the approbation of the successive Surveyors General under whom he had served. On his resignation it was deemed advisable to remove the computing office from Calcutta to the Head quarters of the Trigonometrical Survey at Dehra Dhoon, to bring it into more direct

amounts. On this curious and perplexing subject, Captain Branfill reports as follows :

"I think we can all subscribe to the following facts—The state of the weather and the season of the year have a very considerable effect on our results, as shown by the difference between observers. We have found that the apparent law of our differences is least developed some time in the middle of the cold season. In a run of bad weather (*i. e.* bad for the work) the apparent law of our difference is for the most part marked when the atmosphere is clearest, and when we have supposed our observations to be freest from error ; and conversely in a run of good weather, when the air is hazy from smoke or dust, or greatly agitated by wind, and, in short, when we have found most difficulty in reading the staves, our results have most coincided with each other. Our differences do not appear to vary with the distances of the staves. On the contrary the differences are perhaps even more marked as the day grows older, and the distances of the staves from the instrument are reduced. The general direction in azimuth of the line of our work has some connection with the cumulative differences, and we have noticed that the tendency to differ is more marked when proceeding *towards* a certain point of the compass, than when proceeding *from* that point towards its opposite."

connexion with the Superintendent of the department, and also with the field parties whose computations it has to revise and collate.

21. The distant location of the computing office had entailed the formation of a small office at Head Quarters under the superintendence of J. B. N. Hennessey, Esq., first Assistant Great Trigonometrical Survey, composed of native Surveyors, and newly joined Sub-Assistants, who thus had an opportunity of being rigorously trained in the theoretical portion of their new duties. This little office has lately completed the triplicate manuscript copies of the General report of the north-eastern longitudinal triangulation, between Dehra Dhoon and Purneah, in two thick imperial volumes; it has also been employed in revising the computations of the mountain triangulation of the north-west Himalaya Series, computing 3 volumes of the report of the Levelling operations, and preparing the triplicate general report of the Trans-Indus Frontier Survey; also in supplying elements, examining candidates, instructing new assistants, and other current work.

22. The Drawing Office, under superintendence of W. H. Scott, Esq., Civil Assistant Great Trigonometrical Survey, has been chiefly employed in compiling maps of Kashmir and Ladak, from the plane table sheets sent in by Captain Montgomerie. The first of these large maps has already been transmitted to the Home Government, the second is well advanced. Ten original preliminary charts of the triangulation in different parts of India have been forwarded for the use of the Surveyor General's Office, and duplicates have been prepared for the Geographer to the Secretary of State for India. Triplicate charts have also been constructed for the manuscript volumes of the General Report.

23. Between the completion of a Survey, in this country, and its publication, a long interval invariably elapses, during which even the Supreme and Local Governments are without access to valuable information, acquired but unimpartible, because of the costliness of manuscript maps and the time occupied in their construction. I have therefore been induced to attempt to employ photography for making rapid copies of our maps and charts, as a temporary substitute for the final engravings. This process has of late years been extensively adopted in the Ordnance Survey of Great Britain for reducing maps, as a substitute for the pentagraph. Two complete

sets of photographic apparatus were sent out to this country by the Secretary of State for India, for similar employment, and it is with one of these that I am endeavouring to have our maps copied. The operation is by no means easy, for the apparatus has had to be specially adapted to make full scale copies, and not reductions merely, for which it was originally intended, and the maps require to be drawn with special reference to future copying or reducing by photography. An ordinary finished map cannot be reduced without a large portion of the names becoming too microscopic to be easily legible. In the first Kashmir map the rivers were coloured in blue, and the broken land and low hills in red, the higher ranges being in Indian ink. Consequently a photograph of it would shew no rivers, and would invert the depth of shading of the high and low hills, bringing the latter into excessive prominence.*

24. Captain Melville, who has already been mentioned in connexion with the Topographical Survey of Kashmir, has attained considerable skill as a photographer, and succeeded in making an excellent reduction to half scale of the second Kashmir map, before any names were printed on it. The reduction will have the names inserted by hand, and will then be ready for being copied to full scale, and afterwards printed, for as extensive circulation as the limited means at my disposal will permit. I have every reason to hope that, with Captain Melville's assistance, I may be able to supply a want which has often been seriously felt.

25. In concluding this report of the operations of the Trigonometrical Survey, I am happy to be able to express my opinion that the progress made on all sides, both in the field, and during the recess, by the Survey parties, and by the offices at Head Quarters, has been most satisfactory.

* A Map of Asia between the parallels of 20° and 60° on the scale of 100 geographical miles to the inch, has been recently compiled under my superintendence, partly in this office, and partly in the Surveyor General's of which I had temporary charge from 10th January to 24th March last. It gives the most recent information available from our own and other sources of the countries between St. Petersburg and Peking, Tobolsk and Calcutta. The boundaries of the territories respectively under British and Russian protection are shown, and the caravan routes from India to all parts of Asia. The map is now available in the office of the Surveyor General, Calcutta.

On Dr. Gerard's collection of fossils from the Spiti valley, in the Asiatic Society's Museum.—By HENRY F. BLANFORD, Esq. A. R. S. M., F. G. S.

The paper, of which the following is a revised copy was read before a meeting of the Asiatic Society about eighteen months since, but its publication was fortunately deferred for a time, in order that the illustrations which now accompany it might be completed. In this interval, my friend, Mr. Theobald, returned from a visit to the Spiti valley, and on looking through the fossils which I had described, he communicated to me his conviction that certain of the specimens which I had identified as European Liassic species,* were not from the Spiti valley at all, but, in all probability, Whitby fossils which had been accidentally mixed up with Dr. Gerard's collection. These specimens had been admitted on the same authority as the majority of the others, viz., the Rev. Mr. Everest's figures in the 18th. Volume of the Asiatic Researches, and owing to the neglected state of the collection, and the absence of labels on the majority of the specimens, there had been no means of detecting his error.

The examination of undoubted Whitby fossils, of Col. Strachey's Niti collection and also of M. Jaquemont's collection in the Musée d' Histoire Naturelle at Paris, led me to the same conviction as Mr. Theobald, viz., that the Liassic species were in reality English specimens, and I accordingly wrote a postscript to that effect to be published together with the original paper. Shortly afterwards, however, I returned to India and as the paper had not then been put into type, I considered it better to withdraw and modify it in accordance with the above correction.

A very considerable alteration had indeed become necessary. The collection as originally examined consisted of a fauna in part Triassic, in part Liassic, and partly also Upper Oolitic, some of the species being either identical with species from the Oxford clay or closely allied to forms of that age. The Triassic specimens were not sufficiently numerous to lead me to infer the existence of a distinct formation of that age, and I contemplated the possibility of there being

* *Ammonites heterophyllus*, Sow. *Ammonites bifrons*, Brug. *Ammonites concauus*, Sow. *Ammonites Thoursensis*, D'Orb. *Ammonites communis*, Sow. and *Pecten æquivalvis*, Sow. Five of these were figured by Mr. Everest in the 18th Volume of the Asiatic Researches, as forming part of Dr. Gerard's collection.

a Liassic formation in the Spiti valley, in which, as in the beds of St. Cassian, certain Triassic forms were intermingled. The Upper Oolitic forms, I regarded (with doubt,) as indicating a distinct formation. The fossils I had examined comprised a majority of Cephalopoda, with a few species of Gasteropoda and Conchifera. The Brachiopoda which formed part of the original collection I had not been able to discover in the Society's Museum.

Mr. Theobald's investigations have now established the existence of Triassic beds as well as those of Silurian and Upper Oolitic age, in the Spiti valley while the now proved spuriousness of the Liassic fossils described, eliminates this fauna from consideration. Further research in the Society's Museum, has yielded me the Brachiopoda of Dr. Gerard's collection and a number of other fossils, which, however, (with the exception of one or two ammonites) want of leisure at present compels me to defer for future examination. The former consist of *Producta*, *Spirifer*, *Terebratula* and *Rhynchonella*, some of them of Carboniferous age, but further than this I am not able to pronounce at present. This paper, therefore, confines itself to a description of the genuine portion of those species included in my original memoir.

I have mentioned that while in England I had the opportunity of examining the valuable collection of Oolitic fossils made by Colonel Strachey at the Niti Pass in Kumaon, as well as those from northern Nepal collected by General Hardwicke, and M. Jaquemont's collection from Spiti. This has rendered an alteration necessary in the names of those species which also occur in the above collections and had already been named by authors or discoverers. This has been effected in the present paper.

Class. CEPHALOPODA.

Order. DIBRANCHIATA.

1. BELEMNITES SULCATUS, Miller. Plate I. figs. 1, 2a-c.

This Belemnite is apparently identical with that occurring in the Oolitic rocks of Cutch, which has been described and figured by Mr. Sowerby, (Geol. Trans. 2nd Ser. Vol. V.) as *B. canaliculatus*, Schlottheim.

The Spiti specimens differ from those figured by Miller and D'Orbigny, in the guard being more compressed in form, so that the

dorso-ventral diameter is rather the longer. The angle of the phragmacone is about 17° , while that given by M. D'Orbigny is 18° to $18\frac{1}{2}^\circ$. These differences, however, do not appear to me to warrant specific distinction.

There are several phragmacones of this species in Dr. Gerard's collection. The largest is 2 inches in diameter. The largest guard measures as follows :—

3 in 10 lines long.

— $10\frac{1}{2}$ „ lat. diam.

— $10\frac{1}{2}$ „ ant. post. diam.

Order. TETRABRANCHIATA.

2. AMMONITES ACUCINCTUS, Strachey, Plate I. figs. 3, 3a.

A. testâ discoideâ, percompressâ, complanatâ, sublœvigatâ, obsolete flexuoso-costatâ. Anfractibus complanatis, amplexantibus. Ventre sub-acuto; juniore dentato. Umbilico parvo; marginibus rotundatis. Aperturâ angustè hastatâ. Lobo superiori septorum longiori.

Diameter of shell	1 inch 8 lines	} A fragment wanting the body whorl.
„ of outer whorl	11 „	
Thickness	4 „	

With of outer whorl = $\frac{5.5}{100}$ of the diameter of the shell.

Nearly allied to several Liassic species, viz., *A. oxynotus*, Quenstedt, *A. lynx*, D'Orbigny, and *A. Cohnerti*, D'Orbigny, this Ammonite is readily distinguished by the peculiar palmate form of the saddles, and the length of the superior lateral lobe as compared with the ventral [*quasi* dorsal] lobe. The denticulation of the keel is, as in *A. lynx*, only apparent on the young shell, and becomes obsolete with age. The sides are faintly marked with ribs curved like those of *A. concavus*. Dr. Gerard's collection contains two specimens of this species.

3. AMMONITES STRIGILIS,* n. s. Pl. III. figs. 1, 1a.

A. testâ discoideâ, costatâ, compressè tuberculatâ. Anfractibus amplexantibus, quadratis. Costis simplicibus, compressis, prominentibus, anticè inclinatibus; apud venter, valdè angulatis. Ventre

* There is some doubt whether this specimen be really from Spiti, though there is I think but little question that it comes from the north Himalayan formation. It is one-half of a cut specimen. Another half specimen, (possibly the fellow of the above,) is in the British Museum, its locality being also unknown.

planato, costato. Umbilico angusto; lateribus leniter inclinatis, rotundatis.

Diameter of shell 2 inches 1 line.

„ of outer whorl 1 „ 2 „

Thickness 11 „

Width of outer whorl = $\frac{5.6}{100}$ of the diameter of the shell.

A peculiar form, combining the characters of the *Globosi* and *Amalthei* groups. The young shell is smooth, (in the single specimen described, to beyond the commencement of the body chamber,) and the last half whorl ornamented with strong, simple compressed ribs, inclined forwards from the umbilicus, and becoming more elevated as they approach the ventral region, on the sides of which, they rise almost into tubercles; then becoming less prominent as they bend forward on each side of the median line, they form an angle in the centre, being again elevated at the bend into a series of flattened tubercles. The whorls are rounded in the young, squared in the old shell. The sutures are very imperfectly seen: the saddles appear to be squared in form, and symmetrically divided, and the superior lateral lobe is probably longer than the ventral as in the *Globosi*.

4. AMMONITES WALLICHII, Gray, Plate I. figs. 4, 4a, Plate III. figs. 2, 3.

A. testâ discoideâ, compressâ, transversim costatâ. Anfractibus subcompressis, complanatis. Ventre angusto, excavato, levigato. Costis acutis, bifurcatis, haud tuberculatis. Umbilico lato, profundo. Aperturâ oblongo-quadratâ. Septis, lateraliter 5-lobatis.

Diameter of shell 1 inch 9 lines.

„ of outer whorl $7\frac{1}{2}$ „

Thickness 7 „

Width of outer whorl = $\frac{3.5}{100}$ of the diameter of the shell.

This ammonite, of which there are two specimens in the collection, is allied to *A. Parkinsoni*, Sowerby. The chief points of departure from the latter species are;—the absence of tubercles; the greater width of its whorls ($\frac{3.5}{100}$ instead of $\frac{2.7}{100}$ of the diameter); and some differences in the sutural lobes, the superior lateral being barely so long as the ventral lobe, and having fewer ramifications than that of *A. Parkinsoni*. The two specimens before me differ somewhat

in the characters of the ribbing of the outer whorl, those of the inner whorls being exactly similar: the specimens are of the same diameter, but while that figured at Plate I. fig. 4, appears to be full grown,* that figured at Plate III. fig. 2, is only a fragment, wanting the body chamber, and the body-whorl of the former specimen, as is the case with many Ammonites and Nautili, is thicker than the inner whorls in proportion to their diameter, and exhibits a coarser and wider ribbing, the ribs being rather inclined backwards. *A. fissus*. Sow, from the Oolites of Cutch, bears a general resemblance to the present species, but it appears from the description to have the ribs continuous across the back.

5. AMMONITES OCTAGONUS, Strachey, Plate I. figs. 5a—c.

A. testâ discoideâ, compressâ. Anfr. parum amplexantibus, rotundatis, lateraliter seriebus 3 tuberculis magnis ornatis, irregulariter costatis. Aperturâ ellipticâ. Septis lateraliter 3-lobatis.

Allied to *Ammonites Eugeniei* of Raspail, to which species I referred it in the first instance. It is ornamented with three rows of prominent tubercles connected by depressed and somewhat irregular ribs.

Only one fragment of this Ammonite is in Dr. Gerard's collection, viz., that figured. It does not allow of my determining the spiral proportions.

6. AMMONITES NEPALENSIS, Gray, Plate I. figs. 6, 6a.

A. Nepalensis. Gray, Hardwicke's Illustrations.

A. testâ discoideâ, compressâ, complanatâ, costatâ; anfractibus perlatiis. Costis filiformibus bi-vel tri-furcatis. Ventre rotundato. Umbilico angusto. Aperturâ compressè ellipticâ. Septis ?

Diameter of shell 1 inch 5 lines.

„ of outer whorl 9 „

Thickness $6\frac{1}{2}$ „

Width of outer whorl = $\frac{5\frac{3}{8}}{100}$ of the diameter of the shell.

An Ammonite of the Macrocephali type, but more compressed, ornamented with distinct filiform ribs, bifurcating or trifurcating about the middle of the whorl, and arched forwards in the ventral region. The sutures are not visible. A single specimen occurs in Dr. Gerard's collection. It is much smaller than Dr. Gray's type, and has a somewhat narrower umbilicus. Some large specimens were, however, collected by Mr. Theobald.

* If so, however, the specimen is a small one, as one in Col. Strachey's collection is nearly 4 inches in diameter and one in the British Museum not less than 6 inches.

7. *AMMONITES TENUISTRIATUS*, Gray.

A. tenuistriatus, Gray, Hardwicke's illustrations.

A single cast containing a portion of the body whorl in which is a beautiful cast of an *Aptychus*, is to be referred doubtfully to the above species. The curvature of the ribs is similar to that of the type, but the whorls are narrower and rather thicker. Judging from the few specimens I have seen, *A. tenuistriatus* appears, however, to be very variable in this respect, and I refer the Spiti specimen therefore provisionally to this species.

8. *AMMONITES BIPLEX*, Sowerby, Plate II. fig. 5, Plate III. figs. 4, 4a—c, 5.

Ammonites. Everest. As. Res. Vol. XVIII. Pt. II. p. 114, Pl. I. figs 2, 3.

A. annulatus. Sowerby. Op. et. vol. cit. p. 278.

Several specimens of an Ammonite, which I cannot distinguish from the well known Oolitic species above quoted, occur in the collection, in black siliceous nodules. One large specimen measures 5 inches and 2 lines in diameter. Others less perfect, from 3 to $3\frac{1}{2}$ inches. The width of the outer whorl varies from $\frac{3.3}{100}$ to $\frac{3.7}{100}$ in the more typical specimens, and the aperture is almost orbicular, slightly flattened at the sides. The ribs are sharp and numerous, and bifurcate very regularly at about $\frac{2}{3}$ across the whorl. Most of them have an occasional deep sulcation, indicating the position of a previous mouth. The sutures correspond closely to that figured by M. D'Orbigny in the Pal. Française.

In addition to the above, two specimens, which at first I hesitated to regard as the same species, have the ribs much more numerous, and the whorls wider; the outer whorl being $\frac{3.8}{100}$ and $\frac{4.1}{100}$ respectively, of the diameter. That with the latter measurement is moreover more compressed than the typical specimens, the thickness being $\frac{3.7}{100}$ only. On consideration, however, I can see no good reason for regarding these specimens as specifically distinct from the more typical. Their sutures are very similar, and as regards form, the narrower whorled of the two differs but little from the type, while the peculiar close set ribbing distinctly indicates the specific identity of the two. One of these is figured at Plate III. figs. 4, 4a.

An important point to be noticed in comparing full grown speci-

mens of this species, and indeed of many of the *Planulati* and some other Ammonites, is that the last two or three sutures are frequently closer than the preceding, and are more or less shortened and distorted. In order, therefore, to establish a reliable comparison, and to avoid erroneous specific distinctions, one of the older sutures should be regarded as the standard. I give an illustration of this in figs. 4b and 4c of Plate III. the first of which represents the last suture of the whorl, (that terminating the body chamber,) the second, the sixth suture of the same specimen, counted backwards. I have observed similar irregularities in *A. inflatus*, and many Nautili (e. g. *N. Bouchardianus*,) have the last one or two chambers considerably narrower than those formed during earlier growth.

Fig. 5, Plate III. is the last suture of a specimen of the normal variety of *A. biplex*, which I give as it is the only one visible on any of my specimens.

9. AMMONITES TRIPLICATUS, Sowerby.

Two specimens differ from the preceding in having the ribs, especially those of the last whorl, trifurcate. I have seen specimens both from Niti and Spiti with fasciate ribs, but otherwise undistinguishable from *A. biplex*. I am inclined to doubt whether they be other than varieties of that species.

10. AMMONITES TORQUATUS, Sow.? Pl. III. figs. 6, 6a, 7, 7a, 8.

A. testâ, discoidê, compressâ, costatâ, latè umbilicatâ. Anfractibus rotundatis, depressis, convolutis. Costis filiformibus, rectis, anticè inclinatis, apud $\frac{2}{3}$ anfractuum diametris bifurcatis. Ventre latè rotundato, costato. Aperturâ reniformi. Septorum lobis lateralibus 4.

	<i>a</i>	<i>b</i>
Diameter of shell,	1 inch 6 lines.	
„ of outer whorl,	5 „	9 lines.
Thickness	$7\frac{1}{2}$ „	1 inch $1\frac{1}{2}$ „

Width of outer whorl = $\frac{2.8}{100}$ to $\frac{3.2}{100}$ of the diameter of the shell.

This shell is distinguished from *A. biplex* chiefly by its depressed whorls, and also by the greater width and comparative shortness of the saddles and lobes. The ornamentation of the shell is precisely that of *A. biplex*, and it is indeed possible that *A. torquatus* may be merely a variety of that species, but until specimens of intermediate form, &c., have been discovered, the distinctions I have indicated are too considerable to be disregarded.

11. AMMONITES SPITIENSIS, N. S., Plate II. figs. 4, 4a, 4b.

Diameter of shell, 2 inches 3 lines.

,, of outer whorl, 9 „

Thickness, 11 „

Width of outer whorl = $\frac{3.3}{10.6}$ of the diameter of the shell.

This Ammonite bears some resemblance to the *A. planula* of D'Orbigny, but is distinguished by the following characters:—the whorls of the Spiti species are somewhat narrower, the ribs more flexuous, and arcuated towards the front instead of towards the rear in the ventral area, and the shell is crossed at intervals of rather more than half a whorl, by deep oblique sulcations bounded posteriorly by strong ribs. The sutures are identical with those of the *A. planula*, except that the ventral and superior lateral lobes of the Spiti fossil are equal in length, and it has but two minute accessory lobes, instead of 3, as figured by M. D'Orbigny.

12. AMMONITES GUTTATUS, Strachey, Plate IV. figs. 1, 1a, 1b.

A testâ discoideâ, compressâ. Anfractibus rotundatis, apud umbilicum crassioribus, tuberculato-costatis, 3 sulcis obliquis notatis. Costis numerosis, tenuibus, apud umbilicum 3, 4-fasciatis, apud venter, leniter anticè arcuatis. Venter rotundato. Umbilico profundo, lato, tuberculis 20 coronato. Aperturâ semilunari? Septorum lobis lateralibus 6.

Diameter of shell, 2 inches 1 line

,, of outer whorl, $9\frac{1}{2}$ „

Thickness, 11 „

Width of outer whorl = $\frac{3.8}{10.6}$ of the diameter of the shell.

Very closely allied to the preceding species, from which it is distinguished chiefly by the characters of its sutures; the lobes and saddles being $\frac{1}{3}$ longer, and the saddles narrower than in *A. Spitiensis*; while there are 4 conspicuous and 2 minute lateral lobes instead of 3 of the former, as in the above species. There are also some differences in the ornamentation, but how far these are constant I am unable to say. Thus, in *A. Spitiensis*, the ribs and tubercles are less numerous than in *A. guttatus*, and the sulci of growth are three to each whorl, and continuous in the former species, while in the latter there are barely 2 to the whorl. These latter differences I consider, however, to be unimportant, and should further specimens shew the sutures to be more variable than is usual

in Ammonites of the same group, there would remain no good reason for distinguishing the two forms in question.

13. AMMONITES HYPHISIS, n. s. Plate IV. figs. 2, 2a, 2b.

A. testâ discoideâ, compressâ, costatâ. Anfractibus subquadratis, parum amplexantibus. Costis valdis, rectis; nonnullis (plerumque alternantibus) bifurcatis; medio ventre parum incis, haud interruptis. Ventre planato. Umbilico magno: suturis impressis. Apertura reniformi. Septorum lobis lateralibus 4.

Diameter of shell,	1 inch 10 lines.
„ of outer whorl,	7 „
Thickness,	8 „

Width of outer whorl = $\frac{31}{100}$ of the diameter of the shell.

Intermediate in form between *A. communis*, and *A. Parkinsoni*, this shell is distinguished from the first by the mesial notching of the ribs which indicates an approach to the *Dentati*, (*Ornati* of Von Buch); and from the second by its continuous ribs, as well as by the inferior number of its lobes and their greater equality in size. Some of the ribs carry a small tubercle at the bifurcation, which occurs alternately on the opposite sides of the whorl. The collection contains two small specimens of this Ammonite, which are precisely similar to each other, and a fragment of a larger specimen $1\frac{1}{4}$ inches in thickness.

14. AMMONITES GERARDI, n. s. Plate II. figs. 6, 6a, 6b.

A. testâ subglobosâ, levigatâ, angustè umbilicatâ. Anfractibus ventraliter subcompressis, amplexantibus; senioribus, radiatim latè undulatis. Ventre rotundato. Umbilico parvo, profundo. Aperturâ trigonâ, apud dorsum valde excavatâ.

	a	b
Diameter of shell	2 inches.	$3\frac{1}{4}$ inches.
„ of outer whorl	1 inch.	$1\frac{2}{3}$ „
Thickness	1 „ 2 lines.	$1\frac{1}{2}$ „

Width of outer whorl = $\frac{50}{100}$ of the diameter of the shell.

This Ammonite belongs to a group largely represented in the Triassic beds of St. Cassian, and of which one species only, *A. sternalis*, Von Buch, is described by M. D'Orbigny, Quensted and others from the Upper Lias of France and Germany.* To this species, *A. Gerardi* bears much external resemblance, but the sutural ramifications of the Spiti fossil prove it to be without doubt a distinct spe-

* Several species occur in the Cretaceous rocks of S. India.

cies. Moreover, from such fragments of shell as remain on one of our specimens, it appears that this was smooth in *A. Gerardi* as in the Triassic forms, whereas that of *A. sternalis* is ornamented externally with fine ribs.

The ventral lobe of the septa of *A. Gerardi* is extremely short, barely half as long as the superior lateral lobe, and is divided almost its entire length. The lateral lobes are nearly equal and fan-shaped at the extremity, and the saddles simple and compressed in form.

Four specimens are in the Gerard collection; one of the smaller, a distorted specimen, was figured in the Asiatic Researches; another is here represented. These are both young and do not shew the radiate undulations which characterize the adult shell.*

15. CERATITES? *HIMALAYANUS*, n. s. Plate II. figs. 7, 7a.

C. testâ discoideâ, compressâ, carinatâ, tuberculato-costatâ. Anfractibus amplexantibus, complanatis. Tuberculis internis apud $\frac{1}{3}$ anfractuum 10: externis apud peripheriam 20. Costis haud prominentibus, inæqualibus, plerumque bi vel tri-furcatis. Ventre anguste carinato, haud sulcato. Umbilico parvo; marginibus rotundatis. Aperturâ angulatè ovatâ, anticè complanatâ.

Diameter of shell,	1 inch 6 lines.
„ of outer whorl	9 „
Thickness,	7 „

Width of outer whorl = $\frac{50}{100}$ of the diameter of the shell.

The specimen of this shell in the Spiti collection,* although in a very fair state of preservation, does not present so clean a surface on that part on which alone the sutures are visible, as could be desired for the satisfactory determination of the genus. There is, however, no trace of any foliation on the saddles, so far as they can be seen, while the lobes of one part are distinctly dentated like those of the typical *Ceratites*. It is clearly distinct from *C. Jaquemonti*, Von Buch, the only known Himalayan species of the genus, which according to its discoverer, whose name it bears, was found associated with *Ammonites biplex*, and a number of other Oolitic forms of *Ammonites*.

In form and ornamentation, *C. Himalayanus*, is closely allied to *C. Nodosus*, the type of the genus, but differs in its narrower ventral region and keeled periphery.

* The largest specimens were only discovered after the plates had been finished.

Class. GASTEROPODA.

16. *TURRITELLA MONTIUM*, n. s. Plate I. fig. 7.*Turritella*? As. Res. Vol. XVIII. Part 2, p. 114, Pl. I. fig. 12.

S. testâ crassâ, conicâ, turritâ. Spirâ brevi, angulo 28°. Anfractibus angulatis, medio valdè bicarinatis, supernè obliquis, planatis: ultimo ad basin depressè rotundato. Suturis valdè excavatis. Aperturâ circulari.

Length of fragment, 1 inch 9 lines.

Total length of spire restored, 2 inches 9 „

Width of last whorl, 1 inch.

„ of peristome, 8 „

An obtuse thick-shelled species, with the upper and lower surface of the whorls bevelled towards the suture, ornamented with two spiral keels, the lower of which is the most prominent.

The collection contains three fragments of this species, the largest of which is figured in the Asiatic Researches, loc. cit. and also in the accompanying Plate I.

Judging from its appearance (mineral character) it is from the same beds as the *Ceratite* and *Ammonites Gerardi*.

17. *PLEUROTOMARIA*, sp.? Plate IV. figs. 3, 3a.

Some fragments of casts of a small turretted species with sub-angulated whorls, evidently belong to this genus. The upper surface of the whorls is flattened and oblique, the base convex, and marked on the cast with 4 equidistant ridges, the interval between the posterior ridge, and the keel being twice as great as that between the ridges. Aperture sub-pentangular, rounded in front.

18. *PLEUROTOMARIA*, sp.?

A flat Solarium shaped cast, much distorted by pressure, and water-worn, evidently distinct from the above.

Class. CONCHIFERA.

19. *ASTARTE MAJOR*, Sowerby.

Unio? and *Trigonia*? Herbert and Everest, Gleanings in Science, Vol. III. p. 272, Plate XVII. figs. 4a, b.

Unio? Everest, As. Res. Vol. XVIII. Part 2, p. 114, Plate II. figs. 26, *a*, *b*, *c*.

Astarte planata, Sowerby, Op. cit. p. 278.

Astarte major, Sowerby, Geol. Trans. 2nd series, Vol. V. Plate LXI. fig. 1.

This species, three specimens of which occur in Dr. Gerard's collection, is undoubtedly identical with the Cutch species named as above by Mr. Sowerby. The specimens are smaller than those from Cutch, but in form, only differ in that the anterior end is less truncated, and the length of the shell is somewhat less proportionally, than in the specimen figured in the Geological Transactions, which is stated to be somewhat *wider* (*i. e.* in the present terminology, *longer*) than the average. The measurements of our largest specimen are as follows:—

Length 2 inches 3 lines.

Height 1 inch 7 „

Thickness 1 „

20. CYPRINA? TRIGONALIS, n. s. Plate IV. figs. 4, 5.

C. testâ trigono-cordiformi, crassâ, sub-inflatâ, striatâ, anticè rotundatâ, posticè angulatâ, obtusè carinatâ. Area posteriori levigatâ. Umbonibus prominentibus.

Length 1 inch.

Height 10 lines.

A small trigonal shell, chiefly occurring as casts, and of somewhat doubtful genus. It is associated with *Avicula echinata* in sandstone.

21. NUCULA CUNEIFORMIS, Sowerby.

Modiola. Herbert, Glean. in Science, Vol. III. p. 272, Pl. XVII. figs. 5*a*, *b*, *c*.

Modiola. Everest, As. Res. Vol. XVIII. Part 2, p. 114, Pl. II. figs. 28, *a*, *b*, *c*.

Nucula. Sowerby, As. Res. Vol. cit. p. 275.

Nucula cuneiformis. Sowerby, Geol. Trans. 2nd Series, Vol. V. Plate XXII. fig. 4.

Most of the specimens of this shell are much crushed, and the valves being united, do not admit of examination of the hinge. A small cast, however, apparently identical, but probably from a different bed, shews that the shell is, as surmised by Mr. Sowerby, a *Nu-*

cula. Allowing for the distortion of the specimens, the form so closely resembles that of *N. cuneiformis* from the Cutch Oolites that I cannot hesitate to regard them as specifically identical.

Length 1 inch 1 line.

Height 7 lines.

Thickness 7 „, approximately.

22. CUCULLÆA VIRGATA, Sowerby.

Arca. Herbert, Glean. in Sc. Vol. III. p. 272, Pl. XVII. fig. 6.

Arca. Everest, As. Res. Vol. XVIII. Part 2, p. 114, Plate II. fig. 27.

Cucullæa virgata. Sowerby, Geol. Trans. 2nd Series, Vol. V. Pl. XXII. fig. 1.

The specimens of this shell are much crushed, so that their form is not accurately determinable, but it appears to be identical with the Cutch species, and is characterised by similar sharp radiating ribs, with lines of growth strongly marked towards the margins.

23. INOCERAMUS?

A large concentrically-undulated shell, in bad preservation, appears to belong to this genus. Also a smaller fragment, marked with deep broad concentric furrows distinct from the above. The specimens are insufficient to admit of specific description.

24. MONOTIS CONCENTRICUS, n. s. Plate IV. figs. 6, 6a, 7.

M. testâ obliquo-pyriformi, inæquivalvi, anticè excavatâ, posticè rotundatâ. Valvâ sinistrâ inflatâ, concentricè undulatâ; umbone prominenti incurvatâ. Valvâ dextrâ convexâ, obliquè orbiculari; margine cardinali rectâ; concentricè striatâ, supernè angustè incisâ.

Length about 1 inch 3 lines.

Width 1 „

Thickness 7 „

In form, and in the sculpturing of the left valve, much resembling *Inoceramus concentricus* of the Gault. The right valve resembling that of an *Anomia* in form, with a deep linear notch just under the hinge line. The specimens are not very perfect. They are embedded in a black siliceous stone, similar to that of the nodules in which the *Ammonites* are enclosed. They are associated with *Belemnites Sulcatus*.

25. *AVICULA ECHINATA*? Sowerby.

Some specimens of sandstone are full of the valves of an *Avicula*, which appears to be identical with this widely ranging Oolitic species. None of them are sufficiently perfect to enable me to identify them with certainty, but the form of the ornamented valve, and the sculpturing, so closely resemble those of the type specimens, that there is at least great probability of their identity. If any thing, the Spiti specimens are somewhat more orbicular than those of Europe, but they vary somewhat in form, unless I have confounded two distinct species; a question, which the state of the specimens does not enable me to decide satisfactorily.

26. *MYTILUS MYTILOIDEA*, n. s. Pl. IV. fig. 8.

M. testâ semiovatâ, elongatâ; anticè truncatâ, angulatè planatâ, rectâ; posticè rotundatâ; concentricè striatâ, haud costatâ.

Length 2 inches.

Height 1 „

This shell has precisely the form of the common *Mytilus edulis*. The umbo of the only specimen in the collection, is wanting.

Sub-kingdom. ANNULOSA.

Class. ECHINODERMATA.

27. *SALENIA*? Pl. IV. fig. 9.

An internal cast of a depressed spheroidal *Echinid* with narrow ambulacra, pores in simple pairs, broad interambulacra with five or six plates in each row, and a very large circular disc, the plates of which are not however distinguishable. As regards form it might be either a *Cidaris* or one of the *Salenidæ*, but the size of the disc is such that it can only be referred to the latter family. It seems improbable from its association with Oolitic forms that it should belong to the genus to which I have referred it provisionally (all the known *Salenias* being cretaceous), but the disc is much larger than any known species of the oolitic *Acrosalenia*.

LIST OF ILLUSTRATIONS.

Plate I.

Figs. 1, 2 *a—c*, Phragmacone and guard of *Belemnites sulcatus*, Miller.

„ 3, 3*a* *Ammonites acucinctus*, Strachey.

- Figs. 4 *Ammonites Wallichii*, Gray ; *a*. suture.
 „ 5, *a—b*, *Ammonites octagonus*, Strachey ; *c*. suture.
 „ 6, *6a*, *Ammonites Nepalensis*, Gray.
 „ 7, *Turritella ? montium*, Blanford.

Plate II.

- Figs. 1, *1a—b*, 2, 3, *Ammonites communis*, Sow. - See note, p. 124.
 „ 4, *4a*, *Ammonites Spitiensis*, Blanford ; *b*. suture.
 „ 5, Suture of *Ammonites biplex*, Sow.
 „ 6, *6a*, *Ammonites Gerardi*, Blanf. Sep. *b*. suture.
 „ 7, *7a*, *Ceratites Himalayanus*, Blanf.

Plate III.

- Figs. 1, *1a*, *Ammonites Strigilis*, Blanford.
 „ 2, 3, *Ammonites Wallichii*, Gray.
 „ 4, *4a*, *Ammonites biplex*, Sowerby ; *b, c* first and sixth sutures
 of the same *Ammonite*.
 „ 5, Suture of another specimen.
 „ 6, *6a*, 7, *7a*.—*Ammonites torquatus*, Sowerby.
 „ 8, Suture of the above.

Plate IV.

- Figs. 1, *1a*, *Ammonites guttatus*, Strachey ; *b*. suture.
 „ 2, *2a*, *Ammonites Hyphasis*, Blanford ; *b*. suture.
 „ 3, *3a*, *Pleurotomaria*.
 „ 4, 5, *Cyprina ? trigonalis*, Blanford.
 „ 6, *6a*, 7, *Monotis concentricus*, Blanford.
 „ 8, *Mytilus mytiloidea*, Blanford.
 „ 9, *Salenia ?*

*Remarks on the BACTRO-PALI Inscription from TAXILA.—By
Major-General A. CUNNINGHAM.*

Thirty years have elapsed since the first Bactro-Pali inscriptions were discovered by Ventura, Court, and Masson,—and during that long period but little progress has been made in their decipherment. Certain titles such as *Maharaja* and *Chhatrapa*, or “King” and “Satrap,” and particular terms, such as *Bhagavata S'arira*, or “relics of Buddha,” *māta-pita*, or “mother and father,” *putra*, “son,” and *vihāra*, “a monastery,” have long been known; but the greater portion of these records still continued to baffle all attempts at any satisfactory rendering of their contents. Several of these inscriptions are dated, and so far back as January 1848 I was the first to make out the Hindu months of *Srāvana* and *Chaitra*, and during last year I succeeded in reading the names of the Macedonian months, *Artemisios* and *Apellaios*. The figured dates, however, still remained a riddle; but the recent discovery of Mr. Roberts's Taxila inscription, with its date written as well as figured, in characters much better defined than is usual in these cursive records has enabled Professor Dowson to unravel the mystery of the Bactrian numerical figures. I am indebted to the kindness of Mr. Grote for the copy of this inscription, which has been sent out to India by Mr. Thomas, with the avowed object of obtaining independent translations in anticipation of the receipt of Professor Dowson's rendering of the text.* The following is a version of such parts of this important record as I have been able to make out during the short period that I have had it before me. Although this rendering is imperfect, yet I would fain hope that it may still be of some service towards the object which Mr. Thomas had in view, when he forwarded the inscription to India. My discovery of the Bactro-Pali symbol used for the prefixed *r*, in such important words as *pūrvva*, *sarvva*, and *āchāryya*, and in the names of the Macedonian month *Artemisios*, and the Hindu month *Kārtika*, seems to me to be of sufficient value to warrant the publication of this translation, as it may assist more competent scholars hereafter in rendering versions of other inscriptions.

* Vide vol. xxxi. p. 532.

Transliteration.

Line 1. *Samcats'araye athasatatimae*, 20, 20, 20, 10, 4, 4, (= 78) *mahārāyasa mahatasa MOGASA*, *Panemasa māsasa, divase panchame*, 4, 1, (= 5) *etāye purvvāye, Chhaharasa* (line 2) *Chukhsasa cha, Chhatrapasa LIAKO, KUSULUKO nāma, atasa patropati (?)* ** *Takhas'ilāye nagara utarena pacham des'o Chhema nāma atra* (line 3) *s'apatiko aprativadita BHAGAVATA S'AKA-MUNISA s'ariram patidharati (?) Sangha Rachite (na) sarvva Budhānam puyge, mātā-pitaram puya, yuta* (line 4) *Chhatrapasa saputradārāsa AYU-BALA-VARDHIKA bhrātara sarvva cha, satiga* ** *dharasa cha, puya, mahatana (?) pati-patikasa **** — (line 5) *Rohini gatrena ya imati Sanghārāma Kamika*. On the back, *Patipasa Chhatrapa Liaka*.

TRANSLATION.

In the seventy-eighth year, 78, (in the reign) of the king, the great MOGA, in the month of Panemos, on the fifth day, 5, on this aforesaid date, (in the time) of LIAKA, Satrap of *Chhahāra* and *Chukhsa* (? Hazara and Chach, or Chach-Hazara of the present day) — in the north-western district of *Takhasilanagara*, in (the village) named *Chhema*, (this monument) was made to hold relics of the matchless teacher, *Bhagavata Sakya Muni*, by Buddha Rakshita, for the benefit of all Buddhists, for the benefit of his mother and father, also for the benefit of the Satrap, together with the wife of his son AYU-BALA-VARDDHAKA, and all her brothers, and *** *dhara*; also for the benefit of—(not made out down to the last two words) the monastery of *Nava Kamika*.

Notes on the inscription.

I. On the date. The number of the year is written thus, *athasatatimae*, which is evidently the Sanskrit *ashta-saptatitama*, or eight and seventy. The unit number also occurs, both written and figured, in the year 28, in Masson's Hidda inscription, and again in my Yusufzai inscription from Ohind, in the day of the month. In figures the date of the year is made up of six cyphers, namely 3 twenties, plus 1 ten, plus 2 fours, which together amount to 78. The number of the day of the month is formed in a similar manner, thus, 4 plus 1 = 5, which being preceded by the word *panchame*, or "fifth," leaves no doubt of the correctness of the value assigned to the symbol X. The name of the month is Panemos, which was the ninth of the Macedonian calendar. This is preceded by the words *Mahārāya-*

sa mahatasa MOGASA, which would appear to give the name and titles of the reigning king. The first word I take to be the same as *Maharaja*, as both terms are used indifferently in the Kapurdigiri inscription. The second word, *mahata*, or "great," is well known from the coins as the title of all the later kings both Greek and Scythian. The third word therefore can only be a proper name, which I take to be that of the reigning king. We have a similar mode of expression in my Yusufzai inscription from Panjtar. In this record the month is the Hindu Srâvana, during the reign of the king of the Gushân tribe (*Mahârâyasa Gushânasa*). The name of the king most probably followed the title, but has been lost by the breaking of the stone. I think it probable that the great MOGA of this inscription is the same as the great MOA, or MAUA, of the coins. If the real name was MAWA, it might have been written indifferently either as *Moa*, or *Moga*, as we find in the parallel case of the name of Gondophara, which is written both Undopherras and Gondophares on the coins.

Now the coins of Moas prove, by their superior execution, that he must have been one of the principal leaders of the Indo-Scythian tribes who overthrew the Greek power in India. Indeed the priority of Moas to all other Indo-Scythian Princes, whose coins we possess, is so clear, that it has been admitted at once by all who have examined the subject; but the precise date of his accession to power is still doubtful, although the period may be fixed with some certainty within the narrow limit of about thirty years. For this event the year 100 B. C. has been assigned by H. H. Wilson, and 120 B. C. by Professor Lassen, while my own chronological table, which was framed some twenty years ago, places it in 130 B. C. The mean of these three periods is 116 B. C. which is very close to the date of 126 B. C. assigned by the Chinese for the conquest of Kipin, or Kophene, by the great horde of the *Su*, or *Sakas*. Now if we suppose that Moas, or Moga, was the leader of a branch of the *Su* which settled in the Panjab, we may fix his date at a few years later than 126 B. C. or in about 116 B. C. as just suggested. According to this supposition the era in which the Taxila inscription is dated will be somewhere about 60 years earlier than 116 B. C. or B. C. 176; and the date of the inscription will be $176-78=98$ B. C. Now as the occupation of Transoxiana by the *Su* is stated by the Chinese to have

taken place in the first half of the second century before Christ, it seems to me not improbable that the era in which the Taxila plate is dated, may refer to this particular event. As the year 163 B. C. is quoted by Lassen from the Chinese authorities as the actual date of this conquest, I think that it may be accepted for the present as the most probable approximation to the era used by the Indo-Scythian Sakas. By adopting this starting point, the date of the Taxila inscription will be $163-78=85$ B. C.

In a recent number of this Journal, 1862, p. 425, mention is made of two small silver coins belonging to my cabinet, which are close imitations of the Oboli of Eukratides. The legend is in two lines * * OKO KOZOYAO; and as there is just sufficient room for two letters before OKO, I think it highly probable that the full name will turn out hereafter, when more perfect specimens are obtained, to be AIOKO, which is almost the same as that of the Satrap mentioned in the present inscription. These coins were found near Rawal Pindi, in company with a number of different types of Hyrkodes, and of a few of the barbarous imitations of the coins of Alexander and Seleukos. They appear to me to be about the same age as the coins of Kozola Kadaphes, or about 90 B. C.

But there is another name in the Taxila inscription, if I have read it rightly, which will also serve to fix the date of the record in the early part of the century immediately preceding the Christian era. According to my reading the name of the Satrap's son is *Ayu-Bala-Varddhaka*, "the strengthener of life," which possibly may have been the full name of *Azas*, or *Aya*, as he is called in the native legends of his coins. As *Liaka* was the Satrap of king Moas, there is no improbability in making the Satrap's son Ayu the successor of Moas on the throne of Taxila.

It now remains to fix the date which should be assigned to the *Gushân* era. The leader of this tribe, which is called also *Kushân*, *Khushân*, and *Korân*, was certainly Kozola Kadaphes, as in the inscriptions of all his coins he calls himself king of the *Kushân*, or *Khushân*, whilst on some of them his name is associated with that of *Hermæus*, who is allowed by all numismatists to have been the last of the Greek Princes. Kozola Kadaphes was therefore beyond all doubt the subverter of the Greek power in Kabul. The date of this event is assigned to 85 B. C. by Professor Lassen, and also by

H. H. Wilson, while my own chronological table places it somewhat earlier in about 105 B. C. The mean of these dates would be about 90 B. C. which may be accepted as the approximate date of this event. There is, however, another date connected with the history of the Gushân tribe which has perhaps even a stronger claim to be considered as the starting point of their national era. This is the date on which the king of the Gushân tribe subjected the other four tribes of the *Yuchi*, an event which, according to the Chinese, took place about 100 years after their first settlement in Bactria, or about 26 B. C. The king of the *Gushân* tribe is then said to have conquered Kabul, Gandhara and Arachosia, to which India was afterwards added by his successor. Now according to our present knowledge, the conquest of India can be assigned only to Kanishka, and his brother Hushka, or Huvishka,* whose coins are still found in great numbers on the banks of the Ganges and Jumna. The father of these two Princes would therefore have been the consolidator of the *Yuchi* power by the subjection of the other four tribes. But who was their father? In settling this point we have little, or nothing to guide us, except the inferences derivable from the coins. On these, however, all the authorities are unanimous in making Hima Kadphises the immediate predecessor of Kanishka and his brothers. It is probable therefore that he was also the father of these princes. The main objection to this assumption is the fact that Hima Kadphises does not inscribe the name of the *Gushân* tribe on his coins, as was done by his predecessor *Kozola Kadphises*, as well as by his successors, *Kanerki*, *Hoverke*, and *Bazwano*. But as Hima Kadphises does not inscribe the name of any tribe on his coins, there is a strong probability that he belonged to the same tribe as his immediate successors. By Professor Lassen, Hima Kadphises is assigned to 24 B. C.; by H. H. Wilson to the beginning of the Christian era, and by my own chronological table to 60 B. C. In fixing this date, I was influenced by the opinion that the consolidation of the *Yuchi* power under the king of the *Gushân* tribe, and the subsequent overthrow of the power of the *Su*, or Sakas, were not improbably connected with the defeat of the Sakas by Vikramaditya in B. C. 57. I think still

* Mr. Thomas has ascribed to Babu Rajendralal Mitra the suggestion that Huvishka of the Mathura and Wardak inscriptions is the same as the Hushka of Kashmir history. The suggestion was mine, and was published by me in the note which first made known the name of Huvishka.

that this conjecture is a plausible one, and I am therefore inclined to assign the easily remembered date of 57 B. C. as the approximate period of the consolidation of the *Yuchi* power under the *Gushân* tribe. This important event is also noticed by Trogius Pompeius, who says that the *Asiani* gave kings to the *Tochari*.* The *Asiani* I take to be the same as Strabo's *Pasiani*, and both the same as the *Gushan*, *Kushan*, and *Khushan* of the coins, and the *Kuei-shwang* of the Chinese authors.

I will now apply these eras to the other dated inscriptions which are accessible to me.

No. 1.—Manikyala inscription of General Court; see Thomas' Prinsep's Essays, Vol. I. Plate IX. The second line opens with the date as follows: *San*, 10, 4, 4 (= 18), *etaye purvvaye*, *Maharajasa Gushâna* * * * and the last line gives the month and day, thus: *Kartikasa mâse divase* 20. "In the 18th year, on this aforesaid date, (in the reign) of king Kanishka of the *Gushân* tribe,—in the month of *Kârtika*, on the 20th day." Accepting B. C. 57 as the approximate period of the aggrandizement of the *Gushân* power, the date of this inscription of the reign of Kanishka will be 39 B. C. The local Satrap's name which occurs certainly twice and perhaps three times in this record, I read doubtfully as *Hovedarta*, of which the third letter is purely conjectural.

No. 2.—*Hidda* inscription, No. 13, Tope, Masson:—See Ariana Antiqua, Plate of Alphabet, p. 262—*Samvatsaraye athavis'atiki* 20, 4, 4 (= 28) *mâse Apilaesa ekavisatiki Di*. 20.1 (= 21). "In the twenty-eighth year, 28, in the month of Apellaios, on the twenty-first day, 21." There is nothing in this inscription to show in which of the two eras it is dated; but as the earlier era of 163 B. C. would refer this record to B. C. 135 while the forms of the letters, even allowing for the curative nature of the writing, seem to me to be of later date than the characters on the coins of the first Saka kings Moas and Azas, I conclude that the *Gushân* era is that which has been employed. The date of this inscription will therefore be $57 - 28 = 29$ B. C. The word *s'arira* (relics) occurs shortly after the date, and I observe the word *dharma* twice in the lower line, which ends with *puyae*, the local form of the well known word *punya*.

No. 3.—The *Wardak* inscription, of which a translation has been

* Reges Thocharorum Asiani.

given in this Journal by Babu Rajendralal Mitra. No doubt the general scope of the record has been determined by this first attempt at a complete translation; but I must demur to the Babu's reading of nearly every proper name, except those of *Bhagavata* and *Huvishka*, which had been previously deciphered by myself. I have other objections to make to the values assigned to several of the letters, but I will here notice only the words read as *pushae* and *asanthānam*, which should be *puyae* (for *punya*) and *achdryānam*. Both of these words will be referred to hereafter. This inscription opens with the date as follows:—*San* 20, 20, 10, 1, (= 51) *māsa Artamisiyasa* hi*, 10, 4, 1, (= 15). "In the year 51, in the month of Artemisios, on the 15th ———". One letter only is doubtful, although according to the form given to it in the copy, it should be *ste*, or perhaps *vri*. A similar character occurs again between the words *Vihāra* and *Bhagavata*. The true form of the syllable *vri* occurs on my beautiful little bilingual silver coin of *Vrishni Raja*, and I at first thought that the word might be *vrihi*, or *vridi*, for *vridhhi*, and that it might refer to the fortnight of the increasing moon. But if I have read the date of the Hidda inscription correctly, the days of the Macedonian months must have been numbered up to 30, as was done by the Macedonians themselves. If we might read *dwiti*, or *bati*, or some word meaning "second," then the month would be Artemisios the second, which was the name given to *Daisios* by Alexander the Great shortly before his death.

No. 4 — *Yusufzai* inscription from Ohind, Cunningham—See Jour. As. Soc. Bengal, 1854, and Thomas's Prinsep, Plate X. fig. 2. This inscription opens with the date—*San*, 20, 20, 20, 1 (= 61) *Chetrasa Mahasa Divasa athamiti*, 4, 4 (= 8). "In the 61st year, in the month of *Chaitra*, on the 8th day" (= A. D. 4).

No. 5.—*Yusufzai* inscription from Panjtar, Cunningham—See both plates just quoted. This inscription also opens with the date. *San* 100 (?) 20, 1, 1 (= 122), *Sravanasa masa sudi prathame*, 1, *Maharajasa Gushānasa Ra* (or *Ta*) ——— "In the year 122 (?) on the first of the waxing moon of Sravana (in the reign) of the king of the *Gushān* ———." The value of the figure for hundreds is doubtful; but as the power of the *Kuei-shwang* is said by the Chinese not to have lasted beyond the third century, this figure is most probably the symbol for 100. I confess, however, that in a Bactro Pali inscription dated after the beginning of the Christian era I should have

expected to have found the Bactrian letter *h*, the initial of *hat*, or "hundred," used as the symbol for 100, as we find in the western cave inscriptions, and on the Gupta coins.

In the Taxila inscription the words *etaye purvvaye*, "on this aforesaid" (date), follow immediately after the date; and I think that the same words follow the date in Court's Manikyala inscription. But in the Mathura inscriptions the form of expression is always *asya purvvaye*, as well as in the two copperplate inscriptions of king Hastina, published by Professor Hall. In another inscription, however, which I have lately discovered in the ruins of the ancient *Srāvasti*, the form of *etaye purvvaye* is used. Unfortunately the date of this inscription is lost, with the exception of the cypher for 10, followed by another cypher which could only have been a 4 or a 5, and which together no doubt formed the day of the month. The date of this inscription, however, is the only part that is lost. It is a short record on the pedestal of a colossal statue of Buddha the teacher formed of the red sandstone of Fatehpur-Sikri, and therefore most probably executed at Mathura. The name of *Srāvasti* is mentioned in this inscription, as well as the significant Buddhist terms, *Treṭitaka*, *Bodhi-Satva* and *Bhagavata*. The concluding words are

Kosambakutiya āchāryyānām Sarvastidīnam parigrahe, that is "the accepted gift of the Sarvastidina teachers of the *Kosambakuti*," or upper storied hall named *Kosambakuti*. I found the ruins of *Srāvasti*, as I had already anticipated in a letter to Mr. Bayley written before I visited the place, in the ruined city now called *Sāhet-Māhet*,—*Sāhet* being the city, and *Māhet* the great *Jetavana* monastery adjoining it. In *Sāhet* I recognize the most corrupt form of *Sāwet*, for the Pali *Sāwatthi*, which was the spoken form of the Sanskrit *Srāvasti* or *Sāvasti*. I am happy to say that, on my recommendation the Governor-General has been pleased to direct that this important inscription shall be forwarded to the Society's Museum in Calcutta, and, if possible, the statue also.

I have noticed this *Srāvasti* inscription for the purpose of illustrating the Wardak inscription, of which the last line has been read by Babu Rajendralal Mitra as

esha vihāra asanthānam mahāsanghigana patigaha.

By my discovery of the true form of the prefixed *r*, I am able to read the third word as *āchāryānam*, by which simple change this pas-

sage of the record becomes quite clear and satisfactory, and in accordance with the concluding passage of the Srāvasti inscription just noticed. The translation of this passage is as follows, "This monastery is the accepted gift of the *Mahāsaṅghika* teachers." The *Mahāsaṅghikas* were one of the principal Buddhist sects, the followers of Kasyapa; and the *Sarvāstīdīnas* (or *Sarvāstivādās*) were another numerous sect, the followers of Rāhula, the son of Sakya Sinha.

I may notice here that the oft-recurring word read *pushae* by Babu Rajendralal Mitra is properly *puyae*, for *punya*, the *y* being formed with a rounded head instead of the usual pointed one.

II.—*On the place.* I read the words *Chhaharasa Chukhsasa cha* as giving the name of the district of which *Liaka* was the Satrap, and in which the monument was situated. *Chhahara*, or rather *Tshahara* as it would be pronounced on the Indus, is very probably the original name of the modern Hazāra, and *Chukhsa* of the modern *Chach*. These two names are always joined together in speaking as *Chach-Hazāra*, and it is certain that the inscription was found in the district which is called by this joint name. With regard to the situation of the village I think that there must be some mistake in the copy of the inscription which reads *utarena prachu*, "in the North East," whereas Hasan Abdāl, the place of discovery, is to the North West of Manikyala, or Taxila. By dropping the tail of the *p*, which forms the letter *r*, the word *prachu* will become *pacham*, or West, and the description of the place will thus accord with the actual position of the site of discovery.

III.—*On the Satrap's name.* I have ventured to translate the term *Kusuluka*, as "Red," because I find that there are no less than three kings of the name of Kadphises, who are severally distinguished as *Kozola*, *Kara*, and *Hoemo* (or *Hima*). Where there were so many princes of the same name, it became a matter of absolute necessity to distinguish the one from the other by some characteristic epithets. In these names therefore I read the simple distinctive epithets of *Kazal*, قزل, Red,—*Kara*, قره, Black—and *Handu* or *Handdl*, هندو, White. The last term is of course connected with the Sanskrit *Hima*, and Tibetan *Hyun*, both of which mean snow. In Greek the name is written OOHMO, but in the native character it is simply *Hima*, which I translate as the "White," or the "Fair." Now as all three of these epithets are pure Turki words, the princes

who made use of them must have been of Turki race. This is of importance in the case of Hima Kadphises as we have no other direct proof as to whether he belonged to the *Su* or *Sakas*, or to the *Yuchi*, or *Tochāri*. I will now describe the coins of these three kings.

1st. *Kozola Kadphises*. The coins of this Prince are of three kinds, of which those bearing the name of Hermæus in the Greek legend are most probably the earliest. This Greek legend is as follows ΒΑΣΙΛΕΩΣ ΣΤΗΡΟΣ ΣΥ ΕΡΜΑΙΟΥ, which I look upon as being a blundered copy of ΒΑΣΙΛΕΩΣ ΣΩΤΗΡΟΣ ΕΡΜΑΙΟΥ by a native artist who was ignorant of the Greek characters. This legend will therefore refer to king Hermæus himself. The native legend on the reverse has the name of *Kujula Kapsa*, with the title of *Kushāna Yatugasa*, or king of the *Kushan* tribe. This coin I look upon as having been struck by Kadphises during the lifetime of Hermæus, a practice which we know to have been customary in these provinces. On another coin of the same size and types we read the same native legend, but with the Greek inscription altered to ΚΟΖΟΥΛΟ ΚΑΔΦΙΖΟΥ ΚΟΡ□□Α—that is struck in the name of Kadphises alone. The third kind of this Prince's money is a small copper coin, of stiff but neat execution, bearing the Greek legend of ΚΟΖΟΛΑ ΚΑΔΑΦΕC ΧΟΡΑΝ CΥ ΖΑΘΟΥ, and on the reverse the native legend of *Kujula Kaphsasa Sacha Dharmapīdasa Khushānasa Yatuvasa*.

The coins of *Kara-Kadphises* are of the well known Bull and Camel types, which are always of rude execution and in bad preservation. The Greek legends I can make nothing of, but the native legends appear to be always the same, although the words are disposed in two different ways. The whole of the native legend I have not yet succeeded in making out satisfactorily, but I have deciphered the beginning and the ending beyond all doubt.

Maharajasa Rajatirajasa Deva-putrasa———*Kara Kapsasa* " (coin) of the king, the king of the kings, the God descended———*Kara Kadphises*." The undeciphered portion of the legend consists of three letters, and may possibly be *Kushāna*.

The coins of *Hima Kadphises* are the well known gold and copper pieces which bear the same unvarying legends in Greek and Bactro Pali characters. On the gold coins the Greek legend is simply ΒΑΣΙΛΕΥC ΟΟΗΜΟ ΚΑΔΦΙCΗC, which on the copper coins is

expanded into BACIAEYC BACIAEωN CωTHP METAC OOHMO KAΔΦICHC. The native legend, which is the same on both coins, is as follows—

. *Maharajasa Rajatirajasa Sarvva-logai-s'urasa Mahi-surasa Hima Kadphisasa tradata.* “(Coin) of the king, the king of kings, the lord of the Universe, the supreme lord, Hima Kadphises, the Preserver.” The compound term *Sarvvalogais'ura* I take to be the same as *Sarvvalokes'wara*, the lord of all worlds, the letters *k* and *g* being used indifferently in *Gushān* and *Kushān*. *Mahisura* may be either *Mahī + is'wara* = *Mahī's'wara* the lord of the earth, or *Mahā + is'wara* = *Mahes'wara*, the great lord, but the meaning is much the same.

The only objection that strikes me to my rendering of the terms *Kozola*, *Kara*, and *Hima*, as distinctive epithets signifying Red, Black and White, is the fact that they are not translated in the Greek versions, but simply transcribed. I do not think, however, that this objection has much weight, as we know that the very same epithets when attached to the names of Gaelic chiefs, whether Scotch or Irish, are generally used in the original, as Roderick *Dhu*, Rob *Roy*.

IV.—*On the name of the donor.* The name of *Sangha Rakshita* was a very common one amongst the Buddhists, meaning “preserved, or cherished, by Sangha,” the third person of the Buddhist Triad. It occurs frequently in the Bhilsa and Mathura inscriptions. The name is followed by the words *Sarvva Budhānam puyae, mātā'pitaram puya*, “for the benefit of all Buddhists, for the benefit of his mother and father,” a form of expression which is common to all these donative records. It occurs in Major Pearce's Hazara inscription as *mātā-pitu puyae*; and also in Masson's very perfect inscription on the brass casket found in No. 2 Tope at Bimaran. In this I read the donor's name as *Siva Rachita*, but his father's name is doubtful. The gift consisted of *Bhagarata sarirahi*, or “relics of Buddha,” *sarvva Budhānam puyae*, “for the benefit of all Buddhists. See Ariana Antiqua, Plate 2 of Tope discoveries, for this inscription, in which the final letter of *Budhānam* is omitted, but which is found in Prinsep's copy,—see Vol. I. Plate VI. of Thomas's edition. The peculiar form of the *y* in *puyae* induces me to read the four letters immediately preceding Bhagavata as *deya dharma*, a “religious gift,” a form of expression which is common to most Buddhist donative records, whether found at Benares, at Mathura, or in the Western Caves.

Additional Note, 23rd April.

In the remarks on my Eusufzai inscription from Panjtar I have read the date as the year 122; the only doubtful figure being that for hundreds, which I have taken as 100 on the ground that the power of the Yuchi kings did not, according to the Chinese, last beyond the beginning of the 3rd century. Since writing these remarks I have referred to Gesenius, *Monumenta Phœnic.*, pp. 88, 89, where I find the fullest confirmation of the value which I have assigned to the centenary figure. The contracted word *San*, or "year," is followed by an upright stroke which in Phœnician as well as in Bactro Pali represents the unit 1. This is followed by a symbol, which in Phœnician, Aramæo-Ægyptian, and Palmyrenian is the index for hundreds, the two symbols together signifying simply one hundred, as 1 £ signifies 1 pound.

In the Phœnician scheme the units up to nine are represented by an equivalent number of upright strokes. That this was also the case in the original Bactro Pali scheme is rendered highly probable by the fact that the numbers 4 and 5 in the Kapurdigiri inscription are represented exactly in the same manner. But in the inscriptions under review an independent symbol has been adopted for the figure 4, and I would refer to India as the source from whence this figure was obtained, because in the Khalsi inscription the number 4, as I have already noticed, is represented by a St. George's cross, +, where the Kapurdigiri inscription has four upright strokes.

The Bactro Pali cypher for 10 is also derived from the Phœnician, and the cypher for 20 is merely a duplication of that for 10, one cypher being placed over the other, as in the Aramæo-Ægyptian and Palmyrenian numbers. A reference to Gesenius, pp. 88 and 89, will prove at once that the Bactro Pali scheme of numbers was originally the very same as that of the Phœnicians, and that it was afterwards slightly modified by the adoption of an independent symbol for the number 4, which was introduced from India.

Whether the Indians had a separate and original scheme of their own I am not prepared to say; but the symbols of the dates in the Mathura inscriptions, and on the Gujrat and Gupta coins, are quite distinct from those of the Bactro Pali inscriptions, even although most of them are simple Bactro Pali letters; as for instance the *h* which is the initial letter of the word *hat*, or "hundred."

I have re-examined my two small silver coins which I have attributed doubtfully to the Satrap *Liaka*. There are only three letters of the name remaining, which I have read as OKO; but a more careful scrutiny shows that there is a decided difference in the shapes of the first and third of these letters. The first letter is not only larger but it is also differently formed below, while the last letter, as well as the three *omikrons* in KOZOYAO, is simply a small plain circle. The first letter remaining on both coins can, I think, only be intended for an A. This difference in the shapes of the first and third letters seems to render my attribution of the coins to *Liaka Kusulaka* almost certain.

The Peshawar Vase inscription, of which two copies have kindly been sent to me by Mr. Bayley and Babu Rajendra Mitra, I read as follows.

*Sihilena Siha-Rachhitena cha bharatehi Takhasilæ As'a-thuva
pratithavito sarva Budhanam puyaë.*

"The *Asa* Stupa was erected in Taxila by Sinhila and Sinha-Rakshita, brothers, for the benefit of all Buddhists."

The characters appear to be rather loosely engraved—I have therefore read *thupa* for *thuva*, and *pratithapito* for *pratithavito*.

The peculiar form of the *chh* in *Rachhitena* induces me to read the somewhat similar character in the Wardak inscription as *ch*, and to suggest that the words towards the end of the first line may be read thus :

*Agramatigra Vihara cha Thuva cha Bhagavata Sakya-muni Sari-
ram palidhareti.*

"Both the *Agramatigra* Vihâra and the Stupa were erected for the relics of Bhagavata Sakya Muni."

*Note on Major General A. Cunningham's Remarks on the Bactro-Pali
Taxila Inscription.—By BĀBU RĀJENDRALĀLA MITRA.*

It is with some diffidence that I venture to offer a few remarks on the subject of the preceding paper. Entertaining the highest sentiment of respect for its author as one of the earliest and most successful antiquarians of India, I would never have, under ordinary circum-

stances, presumed to give expression to opinions opposed, even though but slightly, to his views. But the subject of Bactro-Pali inscriptions is involved in so much difficulty, and has as yet derived so little benefit from the researches of oriental scholars that I feel convinced that the following contribution towards its elucidation, insignificant as it is, will not be altogether useless to future enquirers.

To the general scope and purport of the Taxila inscription as interpreted by General Cunningham, I have no objection to offer. They accord pretty closely with a version that I had prepared on the receipt of the last number of the Journal, but which I could not, owing to want of leisure, complete, for presentation to the Society. I think, however, that some of the explanations and inferences of the General are evidently inadmissible. In the first line of the record he reads, after the name of the King Mogasa, the name of the Greek month Panemos, but as the only letters visible are *p*, *m* and *s*, with a blank between the *p*, and the *m*, the deduction is by no means such as can claim immediate confidence. In all the Ariano-Pali inscriptions that have hitherto been decyphered the words for month, year and day have all been taken from the Sanskrita. The system of naming days according to the moon's age is peculiarly Sanskritic, and the division of the month into the light and the dark halves of the moon, is of Indian or Sanskritic origin. *A priori*, therefore, one would expect that the Taxila tablet should have the name of an Indian and not a Greek month, and this expectation is strengthened by the fact that in the Manikyala inscription, the General has himself read the name of the seventh Hindu month *Kārtika*; and we have his authority for the last Hindu month *Chaitra* in the Yusafzai inscription from Ohind, and for the fourth month *S'rāvāṇa* in the Punjtār record from the same locality.

It is to be admitted that in the Hidda inscription he has read the name of *apellaïos*, and in the Wardak vase, the word *artamiseyasa*, but those readings are yet open to question and cannot, therefore, be cited as authorities.

The Hidda record, according to the General, opens with the words,* *Samvatsaraye Aṭhavisatihi* 20, 4, 4, *Māse apilāsa ekavisatihi*, but on referring to the facsimile in the Ariana Antiqua (p. 262,) I find the only letters visible are 4, 4, *Māse apeusa chidasa*, the variants being *u* for *o* in the first word, and *j*, *t* or *v* for *u* in the second. The

* Ante, p. 144.

letters from "Samvat" to "20" do not exist in the original. The word *Mása* is doubtful, as the *m* has a mark at the bottom which is equivalent to an *o* or a *u*, and not an *á*, which is generally indicated by a horizontal or oblique line on the top and never by a stroke at foot, and it is impossible, therefore to read the first syllable as *má* without assuming an error either in the original or the facsimile. For *apilæsa* we have a word which cannot by any possibility have an *l* in it, and for *ekavisatihi* I can find no equivalent syllables, regard being had to the known powers of the Arian alphabet.

In the Wardak record I followed Mr. E. C. Bayley in reading the letter* after the era *aþa chitriyasa vrehi*. General Cunningham, in his correspondence with Mr. B. published in the last volume of the Journal (p. 303), found in those letters the words *artamisiyasa divasa vrehi* which, in the paper under notice, he has changed to *artamisiyasa hi*, dropping altogether the *vre* before *hi* and the *divasa* of his correspondence for which, however there was no equivalent whatever in the original.

I do not presume to deny the possibility of Greek months being named in a Bactrian inscription, for in India it is a common practice in the present day to use the months of one language in the writing of another, such as the English months in Bengali records both official and private, and such might have been the case in the days of the Bactrians in India, but finding that out of the five dated Bactrian inscriptions which have been hitherto discovered, three unquestionably have Hindu months, and the other two are only doubtful, I am disposed to think that it is unwarrantable to assume from a few disjointed syllables a Greek word in an Indian document, when an Indian term may be as easily supplied. Assuming the language of the record to be purely Sanskritic as I shall presently shew it to be, the missing syllable between the *p* and the *m* may be more reasonably supposed to have been an *ncha* than an *n* and in that case the word would be *panchamasa* or the fifth month and not *Panemos*.

The General has noticed the Greek word *Xanthicos* in an inscription discovered by Captain Robinson of the Engineers, but as it has not yet been published, I cannot venture to say anything in regard to it.

In the second line I take the word *etasa* to be the Páli form of *etasya* "of his" or "thereof," and *Patropati* to be a corruption of

patra a car and *pati* "lord;" but owing to a lacuna after the last word its connexion with the subsequent word is not apparent.

In the third line General Cunningham has translated the words, *Sapatika aprativādita* "the matchless Teacher;" but upon what authority I cannot make out. *Sa* in Sanskrita means "happiness" or "felicity," and *patika* "lord," and the two together would make a very appropriate epithet for the founder of Buddhism whose great mission was to rid mankind of the threefold pain of disease, decrepitude and death, and clear the way to final beatitude. The second word is formed of the privative particle *a* and *prativāda* "an opposing argument," with the personal affix *itach*, which would make the whole phrase mean that "none could oppose him in argument." This is a very becoming predicate for S'ākya who has been repeatedly described in the Lalita Vistara and elsewhere as the most distinguished controversialist, from whom the Brāhmanic philosophers fled like jackals from a lion.

About the end of the third line occurs the remarkable word *Puyae*, written often and more correctly with an additional *y* as *puyaye*. In Sanskrita *puya* as a root means "to putrify," and as a noun *puya* indicates "pus," but in neither of these senses can it be used in the inscription. Apparently the word is the dative singular of *puya*, and the position it occupies requires it to imply some good or blessing for the parties named. Hence it is that General Cunningham takes it to be a corruption of *punya* or "religious merit" which he translates into "benefit." In the Wardak inscription the word occurs as *pus'a* but that has been attributed to a mislection on my part of the word *puya*. This, however, I am not willing to admit. The cerebral *s* in the Bactrian alphabet is formed of three lines making the three sides of a parallelogram leaving the bottom open, the *y* being formed of two lines shaped like a cone. Now in the Wardak record the last syllable of *puya* or *pus'a* is made of three lines shaped like a parallelogram, and this more than half a dozen times. General Cunningham, being well aware of it, says that "there they are formed with a rounded head instead of the usual pointed one." It must follow, therefore, that if the word there be *puya* and not *pus'a*, the error is due to the engraver of the original record, and not to the decipherer; and if an error of the kind be admitted, it is just as possible that it should be in the Taxila as in the Wardak monument, the only circum-

stance remarkable being that the word occurs several times in each document and always with perfect uniformity, *puya* in the one and *pus'a* in the other, with the most vexatious constancy. In an unpublished inscription on a steatite vase in the Peshawar museum,* the word appears as *puya*, not *pus'a*, and if this be permitted to incline the balance of probability in favour of that reading, I feel disposed to trace its origin to the Sanskrita root *puj* "to worship;" the *j* of the word being, by local or dialectic peculiarity, changed to *y*. In the present day the *y* in Uriah is invariably pronounced as *j*, and in Bengali it assumes the two forms of য and জ, the former being pronounced as *j* and the latter as *y*, though in the alphabet there is a separate symbol for *j*, and the য whether with or without the dot at the bottom, holds an only place at about the end of the series. The panditas of Bengal observe this distinction even in reading Sanskrita, and frequently quote an ancient verse in support of their practice.† The Nipalese follow the Uriah and pronounce their *y*, whether initial, medial or final, as *j*. According to Yajur Vedic scholars, the initial *y* should invariably be pronounced as *j*, hence the name of their Veda, though written with a *y*, is pronounced as Jajur. In the Kapur di Giri inscriptions the *y* has often been used in the place of *j* and the word *Rájá* changed to *Ráyo* offers a notable instance of the convertibility of the *y* and *j*. These analogies would go a great way to support my assumption of *puya* being a corruption of *puja*, and if this be admitted the meaning of *puyaye*, would be "for the purpose of worship." The supposition that it is a corruption of *punya* has not the support of analogy, for we know of no rule of orthoepy Sanskrita, Páli or Prákrita, which alone can govern the phonology of the Bactro-Páli, by which the sonant *n* can be elided for the benefit of the liquid *y*. The rule in the Prákrita is invariably to drop the semi-vowel and double the surd or the sonant with which it may be associated.

General Cunningham reads the four last syllables at the end of the third line *puya yuta*. I wish to alter them to *puyaye cha* to preserve the syntactic connexion of the clause in which they occur with that which precedes it. The last letter of the line is partially obliterated, and taking it therefore, for the sake of concord as *ch* and not as *t*

[* Vide ante, p. 151.—Eds.]

† पदमध्ये पदान्ते च यकारः पश्यते बुधेः ।

पादादौ च पदादौ च अकारसमासता ॥

which it somewhat resembles, will not, I trust, be represented into a violence against the original.

The phrase *Saputra dārāsa Ayubalavaraddhika* in the fourth line has been explained by General Cunningham as the “wife of his son Ayubalavaraddhika,” but the derivation of the first word of the clause being *sa* “with,” *putra* “a son,” and *dārā* “wife,” its meaning should be “with his son and wife” and the *ayubalavaraddhika*, if a proper noun, should be the name of the wife and not of the son. It might be made to correspond with the next word *bhrātara*, but cannot, in consonance with any rule of Indian Grammar, be made to jump over the wife (*dārā*) and correspond with the son (*putra*). I am disposed to take it for an invocation for the life (*āyu*) and health (*bala* lit. strength) of the satrap and his family. The only objection to this explanation is the fact of the phrase having no case-affix to indicate its connexion, but as such an expression in the Sanskrita would have taken the accusative case, and in the monumental Pāli the mark of that case is often elided, the objection cannot be of any moment.

The last word of the 4th line—*pati patikasa*, has been left untranslated on account of a blot at its end. I think it may be derived from *patti* a “line of infantry,” and *patika* “commander,” and infer therefrom that the concluding word is a declaration in favour of some distinguished general.

Although unconnected with the inscription under notice, I avail myself of this opportunity to observe that General Cunningham’s conversion into *āchāryāntm* of my reading of *asanthānāntm* of the Wardak vase is apparently a very appropriate emendation, being in perfect keeping with the S’rāvastī record lately discovered by him ; but unfortunately for it, it cannot be adopted without declaring one of the two *ns*, so distinctly visible at the end of the word, to be a redundancy.

My observations, I feel, are open to the objection that they are based upon too strict an adherence to the rules of Sanskrita grammar, and cannot therefore be appropriately applicable to the language of the Indo-Bactrians who must have used a mixed tongue, partly Indian and partly Bactrian. But inasmuch as a mixed language implies a mixture of words from different sources in one language, and not the formation of a new language by a combination of the formal elements of different tongues, which is unknown in history, no exception should be taken on the score of my having availed myself of the standard of

the Sanskrita for my guide. As far as I am able to judge from the meagre evidence at my command, the grammar of the Arian inscriptions is unquestionably of Sanskrita origin. Its declensions correspond with the Páli of the Cinghalese on the one hand and the Sanskrita on the other, and closely resemble the Páli of the As'oka records, of which most probably it is a dialectic variety. Like the Páli of As'oka, it has no case-affix for the nominative. The accusative in either is formed by an *m* or the omission of all case-mark just as we find it in the later Prákrita. In the modern Indian vernaculars of Sanskrita origin it is frequently omitted. The instrumental has *ena* both in the As'oka Páli and the Arian. In the Prákrita it changes into *hinto*. For the dative we have in both the dialects the same affix *e* or *ye*. The ablative has not yet been met with in the Arian. The genitive *sa* for the Sanskrita *syā* is common to the Arian, the Páli, and the Prákrita, while the *e* of the Sanskrita locative is almost universal in the Arian vernaculars of India both ancient and modern. In As'oka's Kapur di Giri monument it is represented by *si*, and in the Páli and the Prákrita by *mhi*.

Only a limited number of conjugational affixes have as yet been discovered in the Bactrian inscriptions, but they all assimilate to the Sanskrita more closely than to the Páli of the Cinghalese. The *ti* in *paridharati* and *viharati* of the Taxila and the Rawal Pindi records and the *tu* in *bhavatu* of the Wardak vase, are so identically Sanskrita, that if we had no other evidence to ascertain the relationship of the Bactro-Páli to the ancient classics of India, they would have sufficed to settle it with unquestionable certainty. Dr. Max Müller, talking of the English, says, "The single *s*, used as the exponent of the third person singular of the indicative present, is irrefragable evidence that in a scientific classification of languages, English, though it did not retain a single word of Saxon origin, would have to be classed as Saxon, and as a branch of the great Teutonic stem of the Arian family of speech." And if this argument in favour of grammar being the only criterion of the relationship and classification of languages be true, how strongly must it apply to the Bactro-Páli which, besides its grammar, has nearly the whole stock of its vocables taken from the Sanskrita? I say "nearly" to provide against the possibility of an erratic foreign element occasionally turning up, but as far as my knowledge of those records which have been already translated, is

concerned, I may with perfect safety use the more positive *wholly*. All the words of common life such as father, mother, brother, sister, husband and wife are identically the same in Sanskrita and the Bactro-Páli. The terms for superior, king, governor, master, servant, town, country, mountain and river, in the latter are all taken from the former; and the adjectives, pronouns and verbs, though occasionally altered and rounded by the attrition of use or the laws of phonetic decay, still retain enough of their pristine form to indicate most unmistakably their affiliation to the Sanskrita. Mr. E. C. Bayley, in his remarks on my note on the Ráwal Pindi inscription, has taken exception to the word *Mahi Sachya* which I assumed to be derived from the Sanskrita *Mahá Sachiva* "the great minister," and to two other words. But, admitting for the sake of argument, that they are unSanskritic, the fact will amount to this that there are three foreign nouns in a Sanskritic composition, which can no more affect its character than the scores of Bengali or the thousands of Latin in the English, affect its Teutonic origin. The same may be said of proper names, a great many of which could not but be foreign in a record put up by foreigners in India. The grammar is unquestionably Sanskritic, and that being the blood and soul of the language, it is but reasonable and fair that, in decyphering records in that language, half effaced on mouldering monuments, and written in characters whose powers are not yet fully known, and several of which may be mistaken for half a dozen different letters, the enquirer should seek in the Sanskrita for a key.

It is no doubt remarkable that the language of the Bactrian inscriptions, put up by conquerors in a foreign land, should retain the purity of the native dialect, and be altogether free from the admixture of vocables imported from the speech of the dominant race. It is, indeed, but natural to suppose that those who introduced their alphabet amongst their subject nation should likewise introduce their language; and the contrary is a matter of surprise. But the difficulty vanishes when it is borne in mind that the inscriptions under notice were monumental records, and care was therefore taken to compose them in the purest of vernaculars, and that the Bactrians at the time had not had sufficient opportunity to infuse their language into the current speech of the country.

Mr. Bayley is of opinion "that a foreign element was strong in the trans-Jhelum districts" between the 3rd century before, and the 2nd

century after, Christ; that this "may be guessed from the familiar names of men and places which are certainly for the most part any thing but Pāli or Hindee;" and "that the language of their common use must be *primā facie* expected to partake of a similar character." This argument has led him to the inference that the language of As'oka's edicts is a "quasi religious" or "sacred dialect" and not the current vernacular of his dominions. The first of these two positions may be readily admitted as possible or even probable, but the latter does not seem to be at all connected or dependent upon the other. What we have to deal with is the dialect as we have it before us, and not what it should be. Now a careful examination of the language of the As'oka edicts, clearly shews that it is a stage in the progress or growth of the Sanskrita in its onward course from the Vedic period to the vernaculars of our day, produced by a natural process of phonetic decay and dialectic regeneration, which can never be possible except in the case of a spoken dialect. Professor Max Müller, adverting to these changes, justly says, they "take place gradually but surely, and what is more important, they are completely beyond the reach or controul of the free will of man." No more could As'oka and his monks devise them for religious purposes, than change the direction of the monsoons or retard the progress of the tides. It is said that Marcellus, the grammarian, once addressed the emperor Tiberius when he had made a mistake, saying, "Cæsar, thou canst give the Roman citizenship to man, but not to words;"* and *mutatis mutandis* the remark applies with just as much force to As'oka as to Tiberius. There can be no doubt that As'oka was one of the mightiest sovereigns of India. His sway extended from Dhauli on the sea board of Orissa to Kapur di Giri in Afghanistan, and from Bakra in the north-east to Junagar in Guzerat. His clergy and missionaries numbered by millions; they had penetrated the farthest limits of Hindustan proper, and had most probably gone as far as Bamian on the borders of the Persian empire. Religious enthusiasm was at its height in his days, and he was the greatest enthusiast in the cause of the religion of his adoption. He devised his edicts to promote that religion, had them written in the same words for all parts of his kingdom, and used exactly the same form every where; but with all his imperial power and influence he could not touch a single syllable of the grammar which prevailed

* Apud Max Müller, *Science of Language*, p. 37.

in the different parts of his dominions. In the North West the three sibilants, the *r* above and below compound consonants, the neglect of the long and short vowels, and other dialectic peculiarities, rode rough-shod over the original as devised by him and his ministers and apostles in his palace, and recorded in Allahabad and Delhi; while at Dhauli nothing has been able to prevent the letter *l* entirely superseding the letter *r* of the edicts. Had the language under notice been, as supposed by Mr. Bayley, a "quasi religious" or a "sacred dialect," it would have been found identically the same in all parts of India, for the characters used in the Delhi, Allahabad, Dhauli and Junagar records are the same, and if uniformity had been sought, it could have been most easily secured. But popularity was evidently what was most desiderated, and therefore concessions were freely made in favour of the vernaculars of the different provinces at the expense of uniformity. Unless this be admitted, it would be impossible to explain why the word *Rájá* of Delhi, written in the same characters, should in Cuttack change into *Lájá*. Had the language been a sacred one intended for the clergy only, no such concession would ever have been required. The Sanskrita of the Brahmanic priesthood is alike everywhere, and so is the Latin of the Roman Catholic clergy. It is the people whom As'oka wished to address, and accordingly adapted his language to the capacity and the idiom of his hearers. The differences which have resulted from this concession to the *genius loci* of language have been pointed out at some length by Prinsep;* and they have confirmed the opinion of Wilson,† Thomas,‡ Lassen§ and others that the Páli of the edicts was the vernacular of India at the time of As'oka, and that the peculiarities under notice are the dialectic differences of the different provinces where they occur. By that vernacular it is of course meant to be the language of writing and of the higher orders of the gentry, and in the same sense in which the language of the Parliamentary speeches and of the leaders of the *Times* newspaper would be called the vernacular of England. The common people no doubt spoke dialects of very different degrees of purity in much the same way as we notice dialectic differences in almost the different streets of London from the back slums of St. Giles to Belgravia. All who could read and write could understand the

* Ante VII. p. 220 et 279.

† Journal, Royal Asiatic Society, XII. p. 236.

‡ Thomas's Prinsep, II. p. 44.

§ Essai sur le Páli, p. 15, et Institutiones Linguae Prakriticae, p. 60.

language of the edicts, and those who heard it read out could likewise understand it, and that is all that is intended to be said in regard to its vernacularity.


Philologically considered the language of the edicts is intermediate between the Sanskrita on the one side and the Prākṛita on the other. Lassen says, “que le Prākṛit altère plus le Sanskrit que ne le fait le Pāli, et qu’il offre en quelque sorte, le second degré d’altération, comme le Pāli en est le premier et le plus immédiat.” And inasmuch as the Bactro-Pāli bears the closest resemblance to it with a leaning towards the Sanskrita, we cannot but assign to it a Sanskritic affiliation, and in decyphering it therefore the safest guide appears to us to be the Sanskrita. Hence it is that the more we assimilate it with Sanskrita, the more readily does it become intelligible, while all attempts to decypher it on the hypothesis of its being a mixed language, have hitherto proved completely fruitless.


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*On Ancient Sanskrit Numerals.—By Dr. BHĀU DAJĪ, of Bombay.*

Some time ago I read before the Bombay Branch of the Royal Asiatic Society a paper on ancient Sanskrit numerals, which will, I believe, appear in that Society’s Journal in a year or two. As I think the discovery of the correct value of the numerical symbols is important, perhaps this brief abstract will be deemed worthy of publication in the Journal of the Asiatic Society of Bengal.

In deciphering the inscriptions in the caves of western India, especially those at Nassick, I found many numerical symbols the value of which was at the same time given in words. And as many of them are repeated sometimes in the same series of inscriptions, sometimes in others, without presenting any difference, there cannot possibly be a doubt of the correctness of the following results. The sym-

bol for one hundred is  that for two hundred is represented by one

side spur stroke added to the former  that for three hundred is re-


presented by two side spur strokes  . The symbol for four hundred


has not been found. Strange to say the symbol for 500 is not 4 placed after the symbol for 100, but the number 5 itself joined.





The symbol for 1,000 resembles the Marathi figure for one ; the addition of one side spur stroke doubles its value, and of two side spur strokes trebles it as in the case of the hundreds. Four thousand are represented by the figure 4 being joined to the symbol for one thousand ; and the figure 8 is joined to represent eight thousand. There is a symbol apparently for 5,000, the spelling of which is indistinct. The following are most of the numerical symbols with their spelling in words.


*Nassick cave No. 23 of Mr. Brett's plan.\**


Line 3rd  सतानिबे २०० two hundred (200.)


„ „ 


„ 6th  सवहरे १८ in the 18th year.


„ 10th  सत १०० one hundred.

„ 11th  सवहरे २४ in the 24th year.

„ 12th  दिवसे १० on the 10th day.


„  सवहरे ४ in the 4th year.


„ „  दिवसे पचमे ५ on the 5th day.


„ „  पक्ष ? in the (?) demilunation.

*Cave No. 16.*

In a newly discovered inscription regarding the Abhir dynasty.\*

Line 10th  = द्वे २ two (2.)

„ „  ऋषापणसरसः (?) thousands of Karshapanas (?).

„ 11th  सतानि पच य० five hundred (500.)

*Cave No. 8.*

Inscription by the wife of the Commander-in-Chief Yudnashri Satakarni.

\* Journal, Bombay Br. As. Soc., Vol. V.

- Line 1st ७ सवहरे सातमे in the year seven (7.)
- „ „ = पखेततीथं ३ in the demilunation three.
- Cave No. 16.*
- „ „ ७ = वसे ४२ or ९२ in the year forty-two (42) or ninety-two (92.)
- „ 2nd १ सहस्राणि त्रीणि ३००० three thousand (3000.)
- „ „ १ ३००० 2000 (no spelling in words.)
- „ 3rd १ सहस्राणि २००० Karshapanas two thousand (2000.)
- „ „ १ १००० 1000 (no spelling in words.)
- „ 4th १ सहस्राणि पठ ८००० Nandigur currency, eight thousand (8000).
- „ „ ५ वसे ४० or ९० in the year forty (40) ? or ninety (90).
- „ „ ५५ वसे ४५ forty-five (45.)
- „ 5th १५ five (?) thousand (?) Karshapanas.

Last line which has been extended under another inscription for want of space \* \* \* \* Karshapanas four thousand (4000).


*Cave No. 23.*


In another inscription of Gotamiputra.

- Line 1st ५ सवहरे त्रिकुनवीसे in the nineteenth year (19).
- „ „ = पखेतितीथे in the second demilunation.
- „ „ १८ = दिवसे तेरसे १३ on the thirteenth (13) day.


*In another inscription below.*

- Line 2nd ५३ सव १९ Suva (Sumvatsun) or year nineteen (19).
- „ „ = विष २ Gi. Pa. two (2) (*i. e.* Gimha Pakṣeh) in the second demilunation in the summer season.

„ „  दिव १३ diva thirteen (13) (i. e. on the thirteenth day.)


Line 3rd  दिव ७ diva seven (7) i. e. on the seventh day.

Cave No. 24.

Line 1st  सवदरे षष्ठे ६ in the sixth (6) year.

Karlen Cave.

In an inscription of the mendicant Harapharan the son of Satapharan.

Line 1st  चतुर्विंसे २४ in the year twenty-four.

„ „ in the 3rd demilunation.

„ „ on the second day.

In Somadeva's inscription.

Line 1st in the 7th year.

„ „ in the 6th demilunation.



In Padamāvi's inscription.

Line 1st in the 5th demilunation.


„ 2nd on the 1st day.

In a Chaitya cave at Junner on the Bhima Shunker hill, at its middle, the following numbers are to be found.

Line 2nd, 15 (no spelling.)

„ 4th, 1:  10 (?) [the symbol  resembles somewhat the letter ङ in the Vallabhi copper plates.]

In cave No. 1 in the inscription of an officer of Ushavadāt.

Line 4th  in the year 46 (?)

Kanheri cave, No. 30.

Line 9th, two hundred (200.)

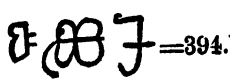
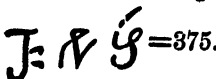
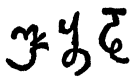
Cave No.

Line 1st, in the year seven hundred and ninety-nine (799).

In the Junnagur inscription of Rudradama.

Line 4th, in the year of Rudradama, seventy-two (72).

In the Vallabhi plates.

 = 394.  = 375.  = 345 (395).

ጥፋፍ=380. ል ጥፋ=310. ጥፋፋ=342.

$\text{H} \equiv \text{H} = 385. \text{H} \equiv \text{H} = 35 \text{ (7 or 9.)}$

*Bhilsa inscription, No. 7.\**

$$\oplus = 93.$$

*Inscription 2nd.*


Handwritten signature: *Handwritten signature*


A very old inscription in the cave character at the top of the Nahnah ghat near Junnara contains a great number of numerals, but their value is not given in words. It records gifts of cows (or perhaps their value in coins) horses, elephants, carts, sapakas (a particular coin) and perhaps clothes. There is one numerical symbol in it which I cannot at present exactly make out. The gifts were made at a great variety of Yadngas or Vedic sacrifices and a study of these will, I trust, enable me to discover their true value.

A correct decipherment of the inscriptions having enabled me to ascertain the true value of the various numerical symbols, it struck me that there would now be no difficulty in reading the exact dates on the Sáh coins of Suráshtra; on looking at these, it appeared that both Mr. Prinsep and Mr. Thomas had read the first numerical symbol in the place of hundreds as if it did not vary in any of the coins; but it was clear to me that in some, the symbol was the plain one for 100, and in others for 200, accordingly a correct reading of those dates would, I thought, enable a Numismatist to arrange the Sáh dynasty in chronological order; I therefore repaired to our learned Vice-President, the Honorable Mr. Newton, whose acquaintance with the Sáh coins is minute and accurate, and would not be surpassed. In going over the large and beautiful collection of coins in his cabinet, the arrangement according to the dates as I now read them, agreed in a most remarkable manner with that which Mr. Newton had already drawn up from a most careful study of the coins for several years. I therefore left the subject of the Sáh coins, their

\* Journal, Asiatic Society, Bengal, Vol. VI. p. 454.

date and arrangement in the able hands of Mr. Newton who will no doubt furnish a luminous paper on the subject. I have placed about three hundred Sáh coins of my own collection at his service and have now only to offer a few remarks on the era in which I think the Sáh coins are dated.

In former papers read before the Bombay Branch of the Royal Asiatic Society, I have attempted to identify the Padamávi of the inscriptions with the Siripulomávi of Ptolemy; and Swámi Chastana, the grandfather of Rudradámá, with Tiastenes, king of Ujjayini, noticed by the same geographer. I placed Rudradámá at the end of the second century of the Christian era, and as we have got a coin of his son bearing date, apparently 104 .

and some of his grandson's bearing date 107  the only era which would place Rudradámá's son at the end of the second century is that of Saliváhana or Sakanripakála, which commences 78 years after Christ. The Nasick inscriptions in particular, show that the Satrap Náhapúna who preceded Padamávi, and Ushavadáta, who is called a Saka, adopted an era, which counted in their time under 100 (either 42 or 92). I am therefore inclined to look upon it as the era of Kshaharáta or Phrahates, one of the Arsacidæ, whose satraps they were. The Sáhás are also Satraps; the type of their coins is that of the Arsacidæ and not that of the Bactrian Greek kings. The very expressions S'akanripa or Saka-king which all the old copper-plates and manuscripts have, indicates a S'aka or Scythian king. The S'akanripakála is observed over a great part of India, in Burmah, Java and Báli; in fact in those countries to which Buddhism was carried from India at the commencement of the Christian era; and corresponding to the spread of the Sakas or Scythians over this peninsula. It is not likely, therefore, that the era prevalent over so large a portion of the globe was derived from the exploits of a humble prince Saliváhana, whose capital was Paithan on the Godáveri, as is commonly supposed. Indeed the word Saliváhana does not occur in any ancient records or manuscripts. A Salaváhana dynasty appears to have reigned at Paithan about the time that the Scythian Satraps ruled over Guzerat, a portion of the Dekhan and the Konkan; and the utmost that can be granted is, that the Hindus of modern times have preferred calling the era of the great Saka-king by the name of

a contemporary Hindu prince at Paithan. I now begin to entertain serious doubts about the Vikramāditya era also. I believe that era too was introduced by the Buddhists or rather the Jainas, and that it corresponds to the victory obtained by Mithridates over the Roman general Crassus, 58 years before Christ. When we remember that there is a difference of four years between the Christian era and the birth of Christ, we can easily understand the Vikramāditya era being dated 57 years before Christ; but I hope to return to this subject at length on another occasion.

#### LITERARY INTELLIGENCE, CORRESPONDENCE, &c.

Dr. Sprenger writes to Mr. Grote from Paris, March 24th.

"I frequently had heard complaints that there was little doing at Paris in oriental literature. As far as the study of Arabic and Persian is concerned I would not say that they are just. On the contrary I find that the pursuits of the new generation of orientalisks have taken a new and better turn. Instead of dwelling on grammatical subtleties and illustrating notes by notes, they enter into the subject. Without underrating the merits of oriental authors, they are not blind to their faults and endeavour to give us an idea of the condition of the east in bye-gone ages, considering language as a means to attain this object. To this school belongs the grandson of a man who was of a very different turn of mind—de Sacy. It is impossible to overrate the beneficial influence of M. Mohl, he is *au fait* on every topic, indefatigable, frank and ready to assist each and every one in his studies. To his endeavours the 'Collection d'ouvrages orientaux' is due, the plan and execution of which leaves nothing to desire. M. Schafer who has spent the greater part of his life in diplomatic service at Constantinople and Teheran, and who has visited Yaman, has collected a number of MSS. of the existence of which I had not an idea, as the *جمهرة* of Ibn Kelby the leading work on the genealogy of Arabic tribes, the *صفه جزيرة العرب* the best book on the geography of Arabia, the *انساب الاشراف* of Baladzory which treats on the history of the noble families of the empire of the Khalifs from Mohammad to his time, including a biography of the prophet which I have found quoted no where except in the *Icāba*—so rare it was in the east;—and three works on the *خراج* or system of revenue, of which only one had been

known previous to his discoveries. In fact every book in his collection is a gem. It appears that Constantinople is after all the place where the best MSS. are to be found, and we must allow that Schafer was the man to select what is valuable. He is an excellent linguist and I hope he will find time to publish some of the materials which he has brought to Europe bearing on the history of eastern civilization, for this seems to have been the main object which he had in view in making his collection. You know Barbier de Maynard's dictionaire Geogr., it is made on the sound plan on which Sir H. Rawlinson intended to translate Yáqút. He intends to give us an edition of Ibn Khordadba, having discovered a MS. at Constantinople. It is the basis of oriental geography and every word which Ibn Kh. says is drawn from official records and therefore valuable. Reinaud has shown me the first proof sheets of a work which will interest you—on the knowledge which the Romans had of the far East, particularly India and China. Wöpke is advancing in his important labour, and will besides soon present us an essay on the history of the Arabic cyphers, which will exhaust the subject. Garcin de Tassy's correct edition and elegant translation of the 'Mantic at Tair' you have of course seen. He is the only and the fittest man to explain to us the system of the Çufies, and it is to be hoped he will continue in this useful career.

You ask whether I am going on with Moqaddasy. I shall soon surprise you with a small treatise on geography containing the itineraries of oriental authors, illustrated with maps founded upon Byrúny and the Atwál. It is intended to supply the place of good maps and enable travellers to find out the spot of ancient cities which exist no more. I believe I mentioned to you that the indefatigable Wüstenfeld is going to publish the large geographical dictionary of Yáqút. Though Yáqút was no more a geographer than Abulfeda, the book will be useful on account of the excellent extracts which it contains. I forgot to mention that Slane has nearly completed the second volume of Ibn Kháldún. This book can only be compared with Montesquieu's 'Esprit des lois,' but it is more philosophical and better founded on facts. Slane was the only man able to translate so difficult a work. M. Schafer read to me yesterday at breakfast the advertisements of new books published in Constantinople. Among them is the Itqán, I wonder whether they have reprinted our edition.

I told Wöpke that the advice of Babu Rajendralála Mitra would in many instances be of great use to him in identifying Sanskrit terms, and I hope he will apply to him, if he should need it.

If you should not succeed in finding a sufficiently good copy of the *Tabakáti Násiry*, you might publish *رامین وایس*. It is a poem which has been translated from the Pehlewy by Nitzámy 'Arúdhya. There is a copy, I believe an unicum, in your Library. It was complete, but the book-binder finding it troublesome to mend the leaves has thrown away some. I should not mind this defect but publish it as it is. As far as I can judge, it is, after the *Shahnáma*, the most important work in Persian literature. As it contains a very great number of obsolete words, care must be taken that it is not modernized by a native editor. The labour of editing is not great, there is only one copy, and consequently no MSS. have to be collated, and the original is beautifully written. All that is necessary is to compare carefully the proof-sheets with the original, you would therefore have little expense on this account.

I talked to Mohl regarding the publication of *Ramyn and Ways*, and he agrees with me in recommending it as one of the most useful works."

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Dr. Weber writes to Mr. Cowell, dated Berlin, April 9th.

"I have to thank you for your edition of the *Kaushítaki-Upanishad*, and the Society for the continuation of the splendid series of the *Bibliotheca Indica* (Nos. 175—185, new series 14—30) and of its *Journal* (Nos. 1—4 of 1861 and of 1862).

The difference of the texts of the *Kaushítaki-Upanishad*, and the curious state of its wording in several places, is a very interesting fact. *Vináyaka* in his commentary to *Sánkhyá*. (= *Kaushítaki*) *bráhmaṇa* V. 5 quotes the first two chapters of the *Āranyaka* (which are closely followed in our MS., Chambers 6770 by the *Upanishad*) as the 31st and 32nd *Adhyáya* of the *brahmaṇa*: तद्यथादो व्यवहितमेकचिंशद्विचिंशत्तथाध्यायोपमानं सोमस्य महाव्रतम् एवमेवैतद्विष्टमहाव्रतं महाव्रविरिति : the *adas* of the text certainly refers to the *Somasya mahávrataṃ* as a later part of the work. On the other hand *Varadattasūta* *Ānartíya* in his commentary to the *Sánkhyá-S'rauta Sūtra* 13, 15, 1 quotes them by the title *Āranyaka*: महाव्रतस्येत्येवमादि यदारण्यकोक्तं महाव्रतं कुर्वन्ति सन्निहः. Both commentators quote several times a *Mahá Kaushítaki bráhmaṇa*. *Ānartíya* tells us (at 14, 2, 3) that the



adhyáyas 14—16 of the sūtra, which bear the appearance more of a brāhmana than of a sūtra, are an *Anubrahmanam*, extracted by the Kalpakāra from the *Mahākaushītaka*, एवं तर्ह्यनुब्राह्मणे तन्महाकौषीतकादाहृतं कल्पकारेण ध्यायन्वे. And Vináyaka adduces the same at several passages as varying from the text which he comments. The deeper looks we get into the literature of the brāhmanas and the sūtras, the clearer we see, that the apparent fixedness of their texts is but a secondary one, that we have in them only the last stage of a long and multiform development.

I am now in possession of a copy of two very good MSS. of the Taittirīya Sanhitá (formerly in the possession of Eug. Burnouf) pada and sanhitá, and I have in mind to give a transliteration of it in Latin type in the Indische Stud., in the same manner as Aufrecht's Rik, but joint with the various readings from the Káthaka and the White-Yajurveda.—Vol. 8 of the Indische Stud., which is now in print already, is to contain two metric treatises of my pen, 1, die Vedischen Nachrichten über Metrik, 2, Pingala's chhandah sūtra with copious introduction and with additions from the Vrittaratnākara, &c. Professor Whitney has given in the Journal of the American Oriental Society, an edition of the Atharva Prátis'ákhya, with notes (I have not yet seen it, but presume the best) and one of the next numbers will contain the Taittirīya Prátis'ákhya. Professor Kern is about to set off for Benares: he takes with him his long and elaborate studies and collections for an edition of Varáhamihira's bṛihat-sanhitá: he will no doubt find new materials in Benares, and your Bibliotheca Indica would be the right place for this most important publication. Professor Bühler (Elphinstone College, Bombay) has finished his essay on the As'vins and is busy with an edition of Gobhila's grihya sūtra with Náráyana's commentary.

Mr. F. E. Hall is reprinting Wilson's Vishnupurana with notes. The 3rd volume of the selected works of Professor Wilson, edited by Rost, and containing Wilson's smaller essays on the Puranas, is to appear in the course of the summer. We have now got here through Trubner and Comp. London, good and comparatively cheap prints from Bombay.

Mr. M. Bréalon, Paris, has given a very clear and lucid essay on comparative mythology, "Hercule et Cacus," which is full of interesting detail. The Petersburg Worterbuch goes on steadily; the last proof sheet reached to पर्मेजि. Of Böhtlingk's collection of

“Sprüche” the first volume (अ-न) is now ready. Dr. Friederich has left with us before he resailed for Batavia, a decipherment and translation of a curious inscription on a Manjus’rī statue.”

Dr. Weber also writes to Bábu Rajendra Lala Mitra.

“Your translation of the Chhándogya Upanishad and the introduction to it deserve all praise: in the latter, however, there are some points in which I cannot quite agree with you. The four new Bráhmaṇas of which you speak at pp. 15, 16, are nothing but the VII. VI. I. and II. Kāṇḍas of the S’atapathīa Bráhmaṇa, as you will easily verify from my edition of it: the names hasti, ushā, havyan and ekvái are corruptions for hastishaṭ (or hastighaṭa,) ukhúsambharana, haviryajno and ekapádiká. It is a pity, that you have not joined the text of the first two chapters of the Chhándogya Bráhmaṇa, (pp. 17, 18,) to this your translation of the eight following adhyáyas. Their context refers to the grihya ritual and its knowledge would be I guess of value for the understanding of the corresponding part of the gobhilagrihyasútra (see Indische Studien, V. 368 ff.). Professor Buhler (Elphinstone College, Bombay) is now busy with an edition of this sútra, and he would no doubt be very thankful to you for a communication of the text in question. We long very much for the conclusion of your valuable edition of the Lalita-Vis-tara and for the continuation of the *text* of the Taittiríya Bráhmaṇa, the third káṇḍa being of much interest on account of its containing the enumeration of the victims at the as’wamedha and the purushamedha sacrifices (compare Váj. Samh. 24—30.) The only copy of it, which I knew till lately in Europe, is very corrupt: but they have in Paris, as I learned some time ago, a very excellent copy, formerly in the possession of Eug. Burnouf.

Aufrecht’s edition of the Riksanhitá in Latin type is now finished, and will be hailed by all engaged in our studies with much fervour. He has also composed a complete Index of all the words contained in it, together with an indication of all the passages, where they occur. But as yet he is not decided when and where he will publish it. His catalogue of the Sanskrit MSS. of the Bodleian is finished in print, excepting the indexes: and these will be completed he hopes in the course of this year. We shall have then before us a most excellent work, a real mine of literary intelligence not to be found any where else.”

Dr. Max Müller has been delivering a second course of Lectures on the Science of Language at the Royal Institution ; the following is the programme.

LECTURE I.—*Saturday, February 21st.*

Introductory Lecture—On the Method of the Science of Language.

LECTURE II.—*Saturday, February 28th.*

On Sound and Meaning.

LECTURE. III.—*Saturday, March 7th.*

On the Physiology of Articulate Sounds.

LECTURE IV.—*Saturday, March 14th.*

On the Causes of Phonetic Variation.

LECTURE V.—*Saturday, March 21st.*

On Grimm's Law.

LECTURE VI.—*Saturday, March 28th.*

The Principles of Etymology.

LECTURE VII.—*Saturday, April 18th.*

The Principles of Etymology.

LECTURE VIII.—*Saturday, April 25th.*

On the Powers of Roots.

LECTURE IX.—*Saturday, May 2nd.*

On Metaphors.

LECTURE X.—*Saturday, May 9th.*

On Ancient Religion.

LECTURE XI.—*Saturday, May 16th.*

On Ancient Mythology.

LECTURE XII.—*Saturday, May 23rd.*

On Modern Mythology.

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#### POSTSCRIPT.

We have just received the following emendation from General Cunningham of his reading of the inscription on the Peshawur vase, (*vide suprà*).

*Nynee Tal, 4th June, 1863.*

This morning I have received a copy of the inscription from Mr. Lowenthal through the kindness of Colonel Maclagan. This copy shows an important difference in the reading of one letter, namely *y* for *s*, which gives at once a simple and intelligible meaning to the record. Instead of *Asa thuva*, the "Asa Stupa," the new reading gives *aya thuva*, "this Stupa."—On a closer examination perhaps a dot will be found after the *y*, thus making the word *ayam*.

PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,  
FOR MARCH, 1863.

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The monthly General Meeting of the Asiatic Society of Bengal was held on the 4th instant.

Lieutenant-Colonel H. L. Thuillier, President, in the chair.

The Proceedings of the last meeting were read and confirmed.

Presentations were received—

From Captain A. K. Comber, Debrooghur, a fine specimen of the head and horns of the Takin (*Budorcas Taxicolor*).

2. From Captain E. Smyth, Futtehgur, the skins of the following animals :—

2 Thibet Ravens.

1 „ Owl.

1 Large Ovis Ammon (female).

1 Young Ovis Ammon (male).

1 Snow Leopard (the Ounce).

1 Thibet Wolf.

2 „ Hares.

3. From Mr. F. K. Dunbar, a specimen of the Red-tailed Tropic Bird (young) (*Phaeton Œtherus*).

4. From Babu Rajendra Mallika, a specimen of the Singapore Fruit Pigeon.

5. From Mons. Garcin de Tassy, a copy of his translation into French of a Persian work entitled *Mantic Uttair* of Farid Uddin Attar.

6. From Major J. Stevenson, Deputy Commissioner of Tavoy, the skull of a Dolphin, found at the mouth of the Tavoy river, and the skin of a Hog-fish.

7. From the Secretary Imperial Society of Cherbourg, through the French Consul at Calcutta, a copy of Vol. VIII. of the Memoirs of the Society.

8. From Colonel C. S. Guthrie, a bag prepared from the bark of the Jack-tree.

The following gentlemen duly proposed at the last meeting were balloted for and elected ordinary members :—

The Right Hon'ble Sir Charles Trevelyan, K. C. B. ; the Hon'ble A. Eden, C. S. ; Bábu Hurry Doss Dutt ; Captain G. Hunter Thompson, Staff Corps ; and H. M. Rogers, Esq., C. S.

The following gentlemen were named for ballot as ordinary members at the next meeting :—

Major C. L. Showers, proposed by Mr. Grote and seconded by the President.

Dr. H. Cleghorn, Conservator of Forests, Madras, proposed by Dr. Anderson, and seconded by Dr. Fayer.

Captain D. MacDonald, Revenue Survey Department, proposed by Major J. L. Sherwill, and seconded by the President.

R. S. Ellis, Esq, C. S., C. B., proposed by Captain W. N. Lees, and seconded by the President.

C. Robertson, Esq., C. S., Banda, proposed by Mr. Bayley, and seconded by Mr. Atkinson.

John Stephenson, Esq. B. A., Educational Department, proposed by Mr. H. Woodrow, and seconded by the President.

Dr. Gordon, C. B., Inspector General of H. M.'s Hospitals, proposed by Captain Lees, and seconded by the President.

The Council reported that they had appointed Mr. E. C. Bayley a Vice-President and Mr. H. F. Blanford a member of their body *vice* Colonel Strachey, who had left Calcutta for the North-Western Provinces.

Communications were received—

1. From Mons. R. de Schlagintweit, a paper entitled *Alphabetical list of the Hot Springs of India and High Asia*.

2. From the Assistant Secretary to the Government of India, Foreign Department, extracts from a Report on the Dependency of Buxtar, by Captain Glasfurd, Deputy Commissioner of the Upper Godavary District, in the Central Provinces, containing an account of the architectural remains in that region, accompanied by copies of certain inscriptions referred to therein.

3. From the Under-Secretary to the Government of India, Home Department, copy of a communication from the Superintendent of

Port Blair, giving an account of further intercourse with the natives.

Mr. Bayley mentioned that intelligence had since been received, that the friendly intercourse here reported had been suddenly interrupted, and an unfortunate conflict had occurred in which a European sailor and a number of the Aborigines had been killed.

4. From Captain Montgomerie a letter on the subject of employing properly trained natives to explore countries beyond the British frontier.

The letter was read by Major Walker as follows :—

*Camp Ladak, July 28th, 1862.*

TO THE SECRETARY OF THE ASIATIC SOCIETY, CALCUTTA.

SIR,—I have now the honor to address you with reference to my proposal, for employing natives in the exploration of countries which are not as yet accessible to Europeans.

I think that for Central Asia, the Mahomedans from our North Western frontier are most likely to supply the best recruits. For Great Thibet and other countries, it may, from time to time, be found expedient to train a different class.

The observations, &c. to be made by such natives should be as simple as possible. The instrumental equipment should be compact and not include anything of a complex character. I should propose the following as the primary objects of their explorations.

1st —The latitudes of important points.

2nd.—The heights of ditto.

3rd.—A rough route survey from point to point.

4th.—An account of each march and of each remarkable place visited.

For the above I think the following instruments would be sufficient, *viz.* :—

1st.—A sextant and artificial horizon or some instrument adapted for taking the altitude of the Polar Star, Sun, &c.

2nd.—A small boiling thermometer to determine the heights of places.

3rd.—A pocket compass with clinometer.

4th.—A good chronometer watch.

The above skilfully used, and the results honestly recorded, would at any rate give us an intelligible idea as to the whole of Eastern Turkistan.

Mahomedans of our North-Western frontier are constantly in the habit of crossing from Ladak into Yarkand, going from thence *via* Kashgar, Kokan, Bokhara, and back by Kabul. The advent of such a party from Ladak would be taken as a matter of course and would excite no suspicion.

If we only got the latitude and approximate height of Yarkand and the other cities of Eastern Turkistan, the result would be very valuable as we are in doubt as to the latitude and height of that portion of Central Asia. As yet the height has been deduced solely from speculations derived from the products of the country, but the great difference between the climate of places in the same parallels of latitude in India and China renders the resulting heights vague.

From the conjoint observations of the compass and watch checked by the latitudes &c., for the direction and time occupied on each march, I should hope that we would also gain a very fair idea as to the longitude of the various places. The natives, moreover, could give us a general account of the country and of the nature of each march. The compass might also be provided with a clinometer so as to give a general idea of the slope of the roads.

The great difficulty of the above scheme is of course, to obtain reliable natives capable of undertaking such journeys and with sufficient nerve to venture into such regions, and who can at the same time be taught to use the instrument efficiently and to record the results accurately.

At present I know of but one man\* fitted for such work and who would require a little training, but I do not think it would be very difficult to get one or two more from Peshawar or elsewhere, who might be trained to the work in a few months. After being trained, the party should first make some experiments in a country which we already know accurately, and as soon as the results prove equal to our expectations, arrangements should be made for an expedition into an unknown territory, and I should propose Eastern Turkistan for the first expedition.

The Nakshabandi Fakir Kwajah Ahmed Shah, who lives in Kashmir, is constantly in the habit of travelling in Eastern and Western Turkistan. He is, at the present moment, I understand, in Yarkand.

\* Mirza Sujjad, who was employed by Major Walker on the Peshawar Frontier Survey.

His son, Gafur Khan, who accompanied him in 1852-53 from Kashmir *via* Ladak to Yarkand, Kashgar, Kokan and back by Kabul, is now in Kashmir; both father and son have, in their clerical character, considerable facilities in moving about Turkistan, where the mass of the population is Mahomedan, and where the Shah (the son) tells me they have a good many followers (*mureed*) of their own, and would consequently not be likely to be interrupted in their travels.

I should propose that either the father or son should be asked to undertake the guidance of two trained native explorers, and I understand from the son that they would be willing to undertake such a charge. He said that he thought that there would be no danger to natives, who accompanied him into Turkistan.

In order to carry out the above it would be necessary to be provided with funds for training the explorers. Say, first man on Rs. 80 and two apprentices on Rs. 20 each per mensem, to be increased when employed in actual exploration to Rs. 100 and Rs. 30 respectively with travelling allowance of say Rs. 10 and Rs. 5 besides, or in all Rs. 110 and Rs. 35 when exploring. The Syud in charge might be given another Rs. 100 per mensem or a present at the end according to the way in which the exploration was effected, guaranteeing him a minimum of Rs. 50 per mensem.

Instruments might be provided in duplicate as far as the watch, thermometer and compass are concerned. It would take, say eight months to train the natives. The exploring party might leave Kashmir on 1st May next. They would reach Yarkand early in July and might spend July, August, and part of September in exploring Eastern Turkistan and return to Kashmir by the beginning of November. They would be out for eight months in the expedition, the expense would hardly exceed Rs. 300 per mensem, even if the head explorer was accompanied by both the apprentices. Their work could be tested by Trigonometrical values right up to the Karakoram pass.

The pay of the Syud and of the explorers would of course have to be separately arranged. I mention the sums above, simply in order to give the best idea I can as to the cost.

The men should be trained at the Head Quarters of the Grand Trigonometrical Survey, or at the Head Quarters of one of the Great Trigonometrical Survey parties.

If the apprentice who accompanied the first explorer turned out



well, he might eventually be put at the head of a second party, and a third apprentice might be trained and explorations made in various other directions as required. After Turkistan, I should recommend exploration to the eastward of the Paukong Lake District, a third in the Lassa direction and so on, but in each case I should recommend that explorers be accompanied by some reliable man\* who has been in the habit of visiting the countries in question. For instance I should think if an expedition is ever sent to Kokan, the Moola Abdul Majeed, who took the Governor-General's letter last year, might be able to take care of the explorers.

The exploration of all the country from Peshawar viâ Kabul and the Sirikol Lake to Kokan would have been a capital commencement, as for more than half the distance we could have tested the explorers' work by Lieutenant Wood's route to Sirikol.

With a small number of trained explorers available, the Asiatic Society would be justified in asking the Government of India to allow them always to send one or more native explorers with such expeditions as the last to Kokan whenever it was considered safe and expedient to do so.

Recommending the subject to the consideration of the Council of the Society,

I have, &c.,

(Sd.) T. G. MONTGOMERIE, Capt. Engrs.

1st Asst. G. T. Survey of India, in  
charge, Kashmir Series.

Major Walker expressed a strong opinion in favour of the plan suggested, and entered into various details as to the best mode of proceeding in case the scheme met the approval of Government, as well as to the time necessary for training natives for such duties. He remarked that the positions of certain places not far from our northern frontier, were uncertain to a very considerable amount of longitude, and that it would be easy to check the large differences now existing in the values of some places of note, as recorded by different authorities, if Captain Montgomerie's plan was carried out, and the native explorers were trained and instructed and their observations and routes checked properly, as he would take care they should be.

\* Mahomed Amin who accompanied Herr Adolphe Schlagintweit and his brothers, would be an excellent man for all parts of Turkistan. He knows the country thoroughly and moves through it at his pleasure.

The President remarked that the question was one of considerable interest and importance to the Society ; it had been submitted for the approval of the Government with the warm support of the Survey Department, but no orders had yet been received. He trusted that the Society would co-operate and add the weight of their influence in inducing the Government to contribute the small means necessary to carry out the measure. When they referred to the new map of Central Asia lately constructed under the direction of Major Walker, and published in the Surveyor General's office here, and observed the comparatively short distance between the British and the Russian frontier, the growing importance of a better geographical knowledge of the intervening countries would be apparent. It was a most remarkable fact that up to the present time, our geographical explorations beyond the British Frontier in almost every direction round Hindustan, were lamentably limited ; this was specially the case on the North-East frontier round Assam, and the valley of the Brahmapootra river, owing to the persevering hostility of the hill tribes against all Europeans. The employment of qualified natives of India, therefore, appeared to present almost the only means, at present likely to be of any avail, and he, therefore, looked hopefully for much good to arise from the present movement.

5. From Baboo Gopinath Sein, abstracts of the results of the Hourly Meteorological Observations taken at the Surveyor General's Office in December last.

6. From the Under-Secretary to the Government of India, in the Public Works Department, a copy of Major General Cunningham's diary as Archæological Surveyor to the Government of India, for the month of December, 1862.

Extracts from Major General Cunningham's abstract printed report of his proceedings as Archæological Surveyor to Government of 1861-62 were read and commented upon by Mr. Bayley.

The President stated that the proceedings of the Archæological Surveyor to Government were of the first importance to the Society, and looking to the interesting contents of the two printed abstract reports which were only intended as mere diaries to satisfy the Government as to the progress made, the ultimate value of Major General Cunningham's researches might be inferred. Doubtless when his work was matured and published, it would prove a most valuable

record of their Society. It was obvious that the history of the ancient remains scattered over this Presidency could not be in better hands. He proposed that the special thanks of the meeting be conveyed to the Government for communicating these reports, accompanied by an intimation of the very high value which the Society places on Major General Cunningham's researches.

The President announced that on the application of the Director of Public Instruction, the Council had granted the use of the meeting-room for a course of geological lectures to be delivered by Mr. H. F. Blanford, and had also permitted the use of such rock specimens and fossils from the Society's collections as might be required to illustrate the lectures.

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FOR APRIL, 1863.

The monthly General Meeting of the Asiatic Society of Bengal was held on the 1st instant.

Lieutenant-Colonel H. L. Thuillier, President, in the chair.

The proceedings of the last meeting were read and confirmed.

Presentations were received—

1. From Major J. T. Walker, a set of photographs of views in Kashmir, prepared by Captain Melville.

2. From Captain Melville, a set of photographs, illustrating the hill tribes on the Peshawur frontier.

3. From the Assistant General Superintendent, North-Western Provinces and Oudh, a parcel containing *Dhatoora Stramonium* in its different forms, as used by the poisoners of Upper India.

4. From A. Grote, Esq., a copy of the first annual report of the Acclimatisation Society of Victoria.

5. From the same, a centipede (*Scolopendra morsitans*).

6. From the Assistant Secretary, Government of India, a copy of the Surveyor General's Report for 1858-59, 1859-60, 1860-61.

7. From Major C. L. Showers, a copy of his letter to Thomas Bazley, Esq., M. P., on the cotton question.

8. From Mr. N. S. Maskelyne, a copy of his paper on the fall of Indian Aerolites, published in the January No. of the *London and Edinburgh Philosophical Magazine*.

9. From the Vienna Museum, through Mr. Oldham, a box of meteorites.

10. From the British Museum, through Mr. N. S. Maskelyne, a small collection of meteoric stones and irons, and a fine series of models of aerolites which have fallen in India.

Mr. Oldham thought the fact of these beautiful casts of Indian aerolites being on the table, rendered this a desirable opportunity for the Society to take cognizance of the hearty co-operation and aid they had received from Mr. Maskelyne, the chief of the Mineral Department of the British Museum. He presumed that a formal acknowledgement would as a matter of course be sent to the Trustees of the British Museum for the specimens sent in acknowledgement of the valuable series which the Society had sent to London. But he thought the Society would fail in its duty, if it did not also acknowledge the obligations it was under to Mr. Maskelyne for the zealous and hearty care he had devoted to the examination and preparation of the specimens.

It would be in the recollection of the Society that some time back, they had sent to the Vienna Imperial Mineral Cabinet some specimens of aerolites, duplicates of their collection, and that subsequently they had sent to the British Museum all their meteorites to be cut and portions retained in the National collection. They were now in possession of the specimens sent by both those Institutions, in return for the Indian series.

The first collection forwarded from Vienna was unfortunately lost by the wreck of the ship in which it had been despatched. To replace this a second had been made, which, although necessarily not quite so valuable as that first sent, was still an excellent series. It contained eight varieties of meteoric stones, and ten of meteoric irons.

The series selected by Mr. Maskelyne of the British Museum contained fifteen varieties of stone meteorites, and nine of irons. The two together made a total of 23 varieties of stones and 19 of irons. But in these two series there were duplicates of eight falls, so that deducting those, the Society now possessed in addition to its own original series of the Indian meteorites, and to the very beautiful casts of other Indian stones now on the table, good typical specimens of twenty meteoric stones and 14 of meteoric irons.

He might add that the Geological Museum possessed about 45 different varieties of meteorites, so that the Calcutta collections, if aggregated, contained about 95 good specimens of meteorites. This

would place the series among the best of second class collections of such objects.

He had the pleasure of more than once going over all these specimens with Mr. Maskelyne last year, during a brief visit to London, and he could testify to the zeal with which their wishes had been carried out. He therefore proposed that the thanks of the Society be tendered to Mr. N. S. Maskelyne for the care and skill he had devoted to the examination and preparation of the specimens of meteorites for the Society's Cabinet.

The motion was seconded and carried unanimously.

11. From Col. C. S. Guthrie, four MSS. in Persian.

Mr. Cowell remarked that these MSS. were a valuable acquisition to the Society.

They were—

1.—A well-written copy of the *Kashful-Mahjúb*, a work on Sufi philosophy.

2.—The *Diwán-i-Haider*, a very rare MS., but unhappily damaged by the corrosive character of the ink employed by the copier. There was no copy of the work in the Society's library, but in Dr. Sprenger's catalogue, mention is made of a *Diwán* by Haider of Herat, which corresponds to the present volume.

3.—*Diwán-i-Sáib*.

4.—*Ruk'at-i-'Alamgiri*, a volume of the letters of the Emperor Aurangzib. There were three collections of the Emperor's letters, of which one had been printed (*Kalamát-i-Taibat*). This was a different collection, and did not seem to be in the Society's collection.

On the motion of the President, the thanks of the meeting were voted to Colonel Guthrie, who was present.

A letter from Mr. H. Braddon, intimating his desire to withdraw from the Society, was recorded.

The nominations of Mr. E. C. Bayley to be a Vice-President, and of Mr. H. F. Blanford to be a member of the Council, vice Colonel R. Strachey, were confirmed.

The Council reported that they had appointed the Hon'ble H. S. Maine, a member of their body in the place of the Hon'ble C. J. Erskine, who had left Calcutta.

The following gentlemen, duly proposed at the last meeting, were balloted for and elected ordinary members :—

Major C. L. Showers ; Dr. H. Cleghorn ; Capt. D. MacDonald ; Hon'ble R. S. Ellis, C. S., C. B. ; C. Robertson, Esq., C. S. ; John Stephenson, Esq., B. A., and Dr. G. Gordon, C. B.

The following gentlemen were named for ballot as ordinary members at the next meeting :—

Lieut. H. R. Thuillier, Royal Engineers, first assistant G. T. Survey, proposed by the President and seconded by Lieut.-Col. Gastrell.

H. D. Robertson, Esq., C. S., Saharunpore, proposed by Mr. Grote and seconded by Mr. Atkison.

P. W. Wall, Esq., C. E., F. G. S., proposed by Mr. Schiller and seconded by Mr. H. F. Blanford.

W. H. Stevens, Esq., proposed by Lieut.-Col. Gastrell and seconded by Mr. Leonard.

Dr. J. Tyler, proposed by Dr. Fayrer and seconded by Mr. Atkinson.

Hon'ble E. P. Levinge, proposed by Mr. Grote and seconded by the President.

W. Edgar, Esq. B. C. S., proposed by Mr. Blanford and seconded by the President.

The Secretary announced that the Catalogue of Mammalia was now ready for issue, price Rs. 2.

Communications were received—

1. From the Secretary to the Government of India, Public Works Department, forwarding a memorandum by Major General Cunningham containing proposals for carrying on excavations at certain localities examined by him during the last year, and informing the Society that His Excellency the Governor-General in Council had authorized the Governments of Bengal and the North-Western Provinces to carry these proposals into effect.

Mr. Bayley read extracts from Major General Cunningham's memorandum, and made some remarks on the subject of his proposals.

2. From Babu Gopinath Sein, an abstract of the result of the hourly meteorological observations taken at the Surveyor General's office, in January last.

Dr. Anderson read extracts from a paper by Dr. Stewart on the Peshawar valley, having special reference to its *flora*.

Mr. Oldham moved that the paper be referred to the Committee

of papers, to be considered with a view to publication; Dr. Fayrer seconded the motion.

The motion was opposed as an unnecessary interference with the discretion of the Council. It was explained that the paper had already been dealt with by the Council in the usual way and that it would be published in due course. The motion had reference to a difference of opinion that had arisen in the Council as to the mode in which supervision should be exercised over the Journal, a minority being of opinion that no paper should be published without a distinct vote of the Council on a report from the Committee of papers. The Council having agreed that their present practice fulfilled all the requirements of the rules and insured all the necessary supervision over the editorial management of the Journal, it was contended that their decision should be accepted until it was formally overruled upon a motion regularly made after due notice given. After a lengthened discussion, the following amendment was finally carried on the motion of Mr. Grote:—

That the present practice of editing the Journal is in harmony with the Society's rules, as explained in the following note, and that it is expedient to adhere to it.

NOTE.—Editing our Journal is one of the specific duties imposed on our Secretaries by Rule 88, and Rule 99, which declares the Journal to be 'under the superintendence of the Council,' does not, as I read it, claim for the latter any greater power of interference than Rule 74 which entrusts to it the 'direction, management and execution of the Society's concerns.'

The Secretary Editor does not contend for an authority *above* that of his colleagues in Council, *all* have the same access to the papers laid before the Society and the voice of one member of the Council has no more weight than that of another.

But for greater convenience the Council have, under Rule 77, appointed a Sub-Committee of papers to assist and advise with the Secretaries in their duty of editing the Journal. This Sub-Committee under Rules 79 and 81, is entirely under control of the Council, whose general power of superintendence under Rule 99 is thus effectually guarded.

The Librarian submitted his monthly report.

## LIBRARY.

The following are the accessions to the Library since the meeting held in February last.

*Presented.*

Annals of Indian Administration Vol. VI. Part 4.—BY THE BENGAL GOVERNMENT.

Bijdragen tot de Taal-Land-en Volkenkunde, Zesde Deel, Nos. 1 and 2.—BY THE BATAVIAN ACADEMY.

The Calcutta Christian Observer for Feb. and March.—BY THE EDITOR.

The Principles of Historical Evidence being a Lecture delivered at a meeting of the Bethune Society by Mr. E. B. Cowell.—BY THE AUTHOR.

Essai Statistique Generale de la Belgique.—BY THE REV. J. LONG.

Foulke's Elements of the Saiva Philosophy translated from the Tamil.—BY THE TRANSLATOR.

Garcin de Tassy's Mantic Uttair ou Le Langage des Oiseaux—Traduit du Persan De Farid Uddin Attar.—BY THE TRANSLATOR.

The General Report on Public Instruction in the Lower Provinces of the Bengal Presidency for 1861-62 with appendixes.—BY THE DIRECTOR OF PUBLIC INSTRUCTION.

Educational Map of Bengal 1861-62 with Index.—BY THE SAME.

Heera or the Hindoo Widow, a didactic poem by P. C. L. M. Duplessis.—BY THE AUTHOR.

Journal of the Statistical Society of London, Vol. XXV. Part 4, for December 1862.—BY THE SOCIETY.

Journal of the Bombay Branch of the Royal Asiatic Society, Vol. I. Nos. 1 to 3, and Vol. II. No. 10.—BY THE BOMBAY SOCIETY.

Journal Asiatique, Vol. XX. No. 78.—BY THE PARIS SOCIETY.

The Journal of the Chemical Society, Vol. XV. Nos. 10 to 12.—BY THE SOCIETY.

Journal of Sacred Literature and Biblical record No. 4, New Series.—BY THE EDITORS.

Kavyanirnaya or a treatise on Rhetorical composition in Bengali by Lal Mohun Bhattacharjea.—BY MR. E. B. COWELL.

Muir's Sanskrit Texts, Part 1.—BY THE DIRECTOR OF PUBLIC INSTRUCTION.

Mineralogical notes and the fall of Indian ærolites, by Professor N. S. Maskelyne and Dr. Viktor Von Lang of the British Museum.—BY MR. N. S. MASKELYNE.

Map of Central Asia compiled by Major J. T. Walker.—BY THE SURVEYOR GENERAL OF INDIA.

Map of the countries of the Mahsood Wuzeeries.—BY THE SAME.



Memoires de la Société Impériale des Sciences Naturelles de Cherbourg Vol. VIII.—BY THE SOCIETY.

The Oriental Baptist Vol. XVI. Nos. 191, 192, and Vol. XVII. Nos. 193 and 194.—BY THE EDITOR.

The Oriental Christian Spectator for December 1862.—BY THE EDITOR.

Report of the British Indian Association for December 1862 and January 1863.—BY THE ASSOCIATION.

Report on the Land Revenue Administration of the Lower Provinces for 1861-62.—BY THE BENGAL GOVERNMENT.

The Twenty-Second Report of the Proceedings of the Calcutta School Book Society, with an appendix.—BY BABU RAJENDRA LAL MITRA.

Vyākaraṇa Pravesh ব্যাকরণ প্রবেশ, by Babu Rajendra Lal Mitra.—BY THE AUTHOR.

Report on the Trade and resources of the countries on the North Western boundary of British India, with maps and a minute on the same by Sir Robert Montgomery.—BY THE PANJAB GOVERNMENT.

General Report on the Revenue Survey Operations of the Bengal Presidency for 1858 and 1861.—BY THE GOVERNMENT OF INDIA.

First Annual Report of the Acclimatisation Society of Victoria.—BY MR. A. GROTE.

Selections from the Records of the Government of India, Public Works Department, Nos. 35, 36 and 37.—BY THE GOVERNMENT OF INDIA.

A letter to T. Bazley, Esq. M. P. on the Cotton question by Major C. L. Showers, *Pamphlet*.—BY THE AUTHOR.

Diwān Saib.—BY COL. C. S. GUTHRIE.

Diwān Hyder.—BY THE SAME.

Rookāyeat 'Alamgiri.—BY THE SAME.

Kashful Mahjúb.—BY THE SAME.

*Exchanged.*

The Athenæum for December, 1862.

The Calcutta Review for January, 1863.

The London and Edinburgh Philosophical Magazine and Journal, Vol. XXIV. Nos. 164 and 165.

*Purchased.*

The Annals and Magazine of Natural History, Vol. XI. No. 61.

The American Journal of Sciences and Arts for November, 1862.

Annuaire des Deux Mondes Histoire Generale des Divers Etats, Vol. XI. for 1861.

Annals des Sciences Naturelles, Zoologie, Vol. XVIII. Nos. 5 and 6.

Bleeker's Atlas Ichthyologique, Part 6.

Bopadeva's Mugdha Bodha Vyākaraṇa with a commentary, 2 copies.

Comptes Rendus, Vol. LV. Nos. 21 to 26, and Vol. LVI. No. 1. .

The Edinburgh Review for January, 1863.

The Discoveries of the world by Antonio Galyano, Edited by Vice-Admiral Bethune, C. B.

Hewitson's Exotic Butterflies, Part 45.

The Natural History Review for January, 1863.

Nöldeke's Hebraische Sprache, *Pamphlet*.

Nidāna Parisishta বিদান পরিশিষ্ট by Hārúdhana Kabirāj, 2 copies.

The Parthenon, Vol. I. Nos. 34 to 37.

The Quarterly Review for January, 1863.

Scheref Námeḥ, Vol. I.

Revue et Magasin de Zoologie, No. 11 of 1862.

Dr. Weber's Indische Studien, Vol. VII. Parts 1 and 2.

The Westminster Review for January, 1863.

Revue des Deux Mondes for 1st January, 1863.

LALGOPAL DUTT.



# JOURNAL

OF THE

# ASIATIC SOCIETY.

No. III. 1863.

*On the Flora of Behar and the mountain Parasnath, with a list of the species collected by Messrs. HOOKER, EDGEWORTH, THOMSON and ANDERSON.—By THOMAS ANDERSON, Esq., M. D. Officiating Superintendent of the Botanic Gardens, Calcutta.*

The Botany of Behar, and especially of Parasnath, the highest mountain in the province, has been carefully investigated within the last few years. Dr. Hooker, in 1848, ascended the mountain and made large collections of plants on it as well as along the Grand Trunk Road to the river Soane, and in the Kymore hills. Mr. Edgeworth has also botanized on Parasnath. More recently, Dr. Thomson spent a few days on the hill in September, 1858, and added many species to the number found by Dr. Hooker and Mr. Edgeworth at another season of the year. In November 1858, Dr. Thomson and myself visited Parasnath, remaining eight days at the Jain temple at an elevation of 4000 feet.

We were accompanied by several plant collectors from the Calcutta Botanic Garden, and were thus enabled to make most extensive collections. We also travelled slowly along the Grand Trunk Road, both while going to and when returning from Parasnath, and we thus succeeded in obtaining many plants that had escaped Dr. Thomson's notice at the less favourable season when his previous excursion was made. The following meagre sketch of the Flora of Behar and Parasnath, and the list of species collected in the Province are founded on the results of these botanical investigations. Dr. Hooker has kindly given me a catalogue of all the plants collected by himself

and Mr. Edgeworth on the occasions I have alluded to. This catalogue contains several important identifications of little known and difficult species which it would have been impossible to make without a reference to the Royal Herbarium at Kew.

The dry and hot region of Behar is covered in many parts with rather a thick forest which always acquires more luxuriance in the vicinity of the hills with which the country is studded. In some parts, the vegetation loses its arborescent character and near the Grand Trunk Road, in many places, patches of land of considerable extent are covered with numerous species of grasses. In other parts, especially where the hills are low and less numerous, the trees are scattered over the face of the country giving a park-like appearance to the scenery. These trees belong principally to umbrageous, full foliated species, among which the commonest are *Bassia latifolia*, *Semecarpus Anacardium*, *Terminalia* and two species of *Urostigma*.

The botanical features of the country from Raneegunge to Parasnath are deserving of a more detailed description.

On the dry sandstone rocks, common near Raneegunge, the dwarf palm, *Phœnix acaulis*, is frequently seen. Along the roadsides, a dusty avenue of stunted trees of *Acacia Farnesiana*, with *Parkinsonia aculeata* extends for some miles. *Phœnix sylvestris* is almost the only tree growing spontaneously in the level uninteresting country about Raneegunge. Tanks, banked up by high bunds of earth covered with thickly planted trees of *Borassus flabelliformis*, (the Palmyra palm) occur near every group of huts. These tanks during many months of the year are nearly dry, but they all contain a large number of interesting aquatic plants, the commonest among which are *Ipomœa reptans*, Poir. *Hydrilla dentata*, Casp. *Vallisneria spiralis*, Linn. *Ottelia alismoides*, DC. and several species of *Potamogeton*, all cosmopolitan. *Sopubia delphinifolia*, G. Don, *Adenosma triflora*, N. ab E. *Hygrophila salicifolia*, N. ab E. and *H. spinosa*, T. Anders. and the aquatic fern *Ceratopteris thalictroides* are seldom absent from the muddy margins of these tanks. Near the bungalow at Asinsole, we observed in November several fields covered with the orange-coloured flowers of *Guizotia oleifera*, cultivated for its oil-yielding seeds. Between Raneegunge and the Barakur, no spontaneous arborescent vegetation occurs, at least near the Grand Trunk Road, but bushes of *Zizyphus*, *Combretum nanum*, Ham. and a subscandent

or. prostrate *Tragia* are mingled with stunted semi-spontaneous plants of *Borassus flabelliformis* and *Phoenix sylvestris*.

A short distance beyond the Barakur river, the Grand Trunk Road enters the low jungle which covers a great portion of Behar. *Grislea tomentosa*, Roxb. *Butea frondosa*, Roxb. *Diospyros tomentosa*, Roxb. *Carissa Carandas*, Linn. *Sponia orientalis*, *Baliospermum polyanthum*, Wight. and *Breidelia spinosa*, Willd. are the most prevalent species in the lower jungle. Where the hills approach the road, as at Gyra, trees of *Vatica robusta* W. and A. *Cochlospermum Gossypium* D. C. *Soyimida febrifuga*, Juss. *Terminalia*, *Bassia* and *Symplocos* give a more arborescent character to the vegetation. In the cold season, about November, the slopes of the low hills near Gyra and Topechancee are whitened by the pale floral leaves of *Ichnocarpus frutescens*, R. Br. a climbing plant belonging to the natural order *Apocynaceæ*. During the cold season, the partially dried-up rice-fields yield a rich harvest of rare and peculiar plants among which may be mentioned as most characteristic, five species of *Ammannia*, *Ameletia Indica*, three species of *Utricularia*, and *Burmannia*.

Parasnath rises somewhat abruptly from the plain of Behar to the height of 4,500 feet above the sea. The mass of the mountain is not extensive, but judging from the character of the vegetation on its slopes, the mountain must exert a considerable influence on the amount of moisture in the atmosphere. Accordingly, many species of plants are confined to the mountain and its immediate vicinity probably from their inability to withstand the hot dry climate of the plains and lower hills. The influence of the mountain is shown around the base by the disappearance of the low jungle, its place being taken by large trees of *Dillenia speciosa* and *D. pentagyna*, *Saccopetalum tomentosum*, *Sterculia urens*, *Terminaliæ*, 2 *Myrtaceæ*, *Vatica robusta*, *Rubiaceæ* among which, the most conspicuous are *Nauclea parviflora* and *N. cordifolia*.

A few species of *Ampelideæ*, *Convolvulaceæ*, especially *Porana paniculata* and *Erycibe paniculata*, with *Ichnocarpus frutescens* among *Apocynaceæ*, represent the gigantic climbers of the moist forests of other parts of India. As the sides of the mountain are approached, the forest becomes denser, the trees larger, and the number of species more abundant than around the base, *Terebinthaceæ* and *Leguminosæ* are by far the commonest orders, and of the latter the genera

*Dalbergia* and *Bauhinia* occur more frequently than any other. Large climbers of Leguminosæ, such as *Pueraria tuberosa*, *Mucuna*, *Cana-valia*, *Otosema macrophylla* and *Bauhinia Vahlia*, are most abundant above 2,000 feet elevation. The undergrowth of these forests consists principally of Leguminous shrubs; *Rubiaceæ*; *Compositæ* of the genera *Vernonia* and *Blumea*; *Acanthaceæ* represented principally by *Strobilanthes auriculatus*, *Dædalacanthus purpurascens*, and *Barleria cristata*; *Scrophularineæ* and *Labiata* occur chiefly as inconspicuous herbs. Among *Scrophularineæ*, two species of *Alectra* deserve to be noticed; one of them, a new species, nearly allied to the African one *A. orobanchoides*, *Benth.* occurs in one locality as a lurid, leafless plant, parasitic on the roots of *Strobilanthes auriculatus*.

About 4,000 feet, three species of *Aralia* appear, but they are confined to the cool, dark ravines. From 4,000 feet to the summit, the few species representatives of the subtropical vegetation of the mountain ranges of India are found. These species are *Clematis Gouriana*, and *C. nutans*, *Thalictrum glyphocarpum*, *Berberis Asiatica*, *Geranium Nepalense*, *Pygeum lucidum*, mihi, *Rubia cordifolia*, *Buchnera hispida*, *Habenaria plantaginea* and *H. commelinifolia*, *Disporum* sp. None of these species are numerous enough in individuals to give any character to the vegetation of the summit. *Clematis nutans*, the most tropical of them, is most frequently met with. Of *Pygeum lucidum* only a solitary tree was found on the mountain, on the northern side of the central peak.

The distribution of a few of these species is worthy of notice. *Clematis nutans* is found on the Khasia hills distant, 400 miles from Parasnath, and in Kumaon and Gharwal at a distance of 600 miles.

*Thalictrum glyphocarpum* is widely distributed over the mountain ranges of India, viz., the Himalaya, Khasia hills, mountains of southern India and Ceylon. In all these ranges, it never occurs below an elevation of 6,000 feet whereas in Parasnath it is met with at 4,000 feet.

The nearest point to Parasnath where *Berberis Asiatica* occurs is the outer ranges of Kumaon and Gharwal, Parasnath being the southern limit of this species.

*Geranium Nepalense* occurs only on a few grassy spots near the highest peaks of Parasnath and flowers in the cold season, after the 15th

November. This species is found in the Himalayas, the Nilgherries and the mountains of Ceylon. In the Himalayas it flowers in the summer months, and its lower limit is 2,000 feet higher than the summit of Parasnath.

The general resemblance of the Flora of Parasnath to that of the dry less elevated mountain ranges of central and southern India is undoubted. To prove this, the following features of that Flora and of Parasnath are sufficient. The most prominent negative characters of both these Floras are the absence of *Anonaceæ*, *Ternstræmiaceæ*, *Pittosperaceæ*, *Rhamnaceæ* (except *Zizyphus*), *Rosaceæ*, especially tropical *Rubi*, *Araliaceæ*, *Myrsinaceæ*, *Cornaceæ*, *Apocynaceæ*, *Lauraceæ*, *Amentaceæ*, *Aroideæ*, *Orchideæ* and *Ferns*.

The following orders preponderate in both these Floras, but none of them give a definite aspect to the vegetation of these districts.

*Sterculiaceæ*, *Buettneriaceæ* and *Tiliaceæ* are proportionally numerous both on Parasnath and in central India. To these may be added as quite as prominent in the vegetation, *Olacineæ*; *Terebinthaceæ* especially in number of genera; *Leguminosæ*; *Combretaceæ*, *Lythraceæ*, *Rubiaceæ*, *Compositæ*, especially the genera *Vernonia*, and *Blumea*; *Convolvulaceæ*; *Cordiaceæ* and *Gramineæ*.

The fact of a few peculiar genera and species being common to both these Floras is of more importance as a proof of the affinity of the vegetation of the two regions than deductions drawn from the excess of certain orders. I enumerate the most important of these genera or species which are either identical in species or have representative and allied species in each Flora.

*Kydia calycina* Roxb., in both.

*Cochlospermum* Gossypium, DC. ditto.

*Eriolæna* Hookeriana, W. and A. ditto.

*Olax scandens*, Roxb., ditto.

*Ougeina dalbergioides*, Benth., ditto.

*Hardwickia binata*, Roxb., ditto.

*Dædalacanthus purpurascens*, T. Anders. ditto.

The following genera are common to both Floras having closely allied species in each.

*Pygeum*,

*Elæodendron*,

*Zizyphus*,



Sophora,  
Terminalia,  
Cordia,  
Ehretia.

Both these lists might be much increased, especially if the geographical distribution in India of the species of Gramineæ was better known.

The following table of the number of species in a few of the larger natural orders will shew how much Leguminosæ and Gramineæ exceed the others. The materials of the entire Flora of Behar are the basis of the tables.

| <i>Natural orders.</i> | <i>Genera.</i> | <i>Species.</i> |
|------------------------|----------------|-----------------|
| Leguminosæ,            | 44             | 89              |
| Gramineæ,              | 47             | 84              |
| Compositæ,             | 28             | 47              |
| Rubiaceæ,              | 16             | 27              |
| Scrophularineæ,        | 18             | 26              |
| Labiataæ,              | 16             | 24              |
| Acanthaceæ,            | 15             | 23              |
| Euphorbiacæ,           | 15             | 23              |
| Cyperacæ,              | 13             | 20              |
| Convolvulacæ,          | 9              | 16              |
| Malvaceæ,              | 6              | 13              |
| Lythracæ,              | 6              | 13              |
| Urticacæ,              | 7              | 11              |
| Orchidaceæ,            | 8              | 11              |
| Tiliaceæ,              | 3              | 10              |

The remainder of the Natural Orders have under ten species each.

The total number of species included in this Catalogue is 738 belonging to 473 genera and 110 Natural orders.

These are distributed in the three classes in the following numbers.

|                  | <i>Genera.</i> | <i>Species.</i> |
|------------------|----------------|-----------------|
| Dicotyledones,   | 359            | 560             |
| Monocotyledones, | 96             | 157             |
| Cryptogameæ,     | 18             | 21              |

#### APPENDIX.

During eight days that Dr. Thomson and I remained at the Jain temple on Parasnath, at an elevation of 4,000 feet a few observations

on the height of the barometer and on the temperature of the air were recorded. I am not aware of any other observations taken during November having been published, I have therefore inserted them at length as they may be useful in comparing the climate of the cold season of Parasnath with that of other periods of the year. The instruments used were a mountain barometer by Newman, a delicate thermometer by the same maker, and a good minimum thermometer.

*Record of Barometric and Thermometric Observations.*

| Date.     | Hour.    | Barometer. | Thermometer. | Detached Thermometer. |                                                                                                                             |
|-----------|----------|------------|--------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Nov. 13th | 9 P. M.  | ...        | ...          | 57°                   | Air still, sky cloudless.                                                                                                   |
|           | Min.     |            |              |                       |                                                                                                                             |
| 14th      | Ther.    | ...        | ...          | 51°                   | } Gentle northerly breeze all day.                                                                                          |
| "         | 10 A. M. | 26.222     | 63°          | 57.5                  |                                                                                                                             |
| "         | 2 P. M.  | 26.149     | 60°          | 59°                   |                                                                                                                             |
| "         | 4 P. M.  | 26.143     | 60°          | 60.5                  |                                                                                                                             |
| "         | 6 P. M.  | 26.155     | 58°          | 56°                   |                                                                                                                             |
| "         | 8 P. M.  | 26.208     | 58°          | 52°                   |                                                                                                                             |
| 15th      | Min.     | ...        | ...          | 47°                   |                                                                                                                             |
| "         | 8 A. M.  | 26.222     | 58°          | 50°                   |                                                                                                                             |
| "         | 10 A. M. | 26.241     | 60°          | 56.5                  |                                                                                                                             |
| "         | 3 P. M.  | 26.167     | 61°          | 61.5                  | Light clouds & northerly breeze.                                                                                            |
| "         | 4 P. M.  | 25.158     | 61°          | 59.5                  | Light clouds & southerly breeze.                                                                                            |
| "         | 6 P. M.  | 26.188     | 60°          | 57°                   | Ditto ditto.                                                                                                                |
| "         | 8 P. M.  | 26.224     | 59°          | 56°                   | Ditto ditto.                                                                                                                |
| 16th      | Min.     | ...        | ...          | 52°                   |                                                                                                                             |
| "         | 8 A. M.  | 26.238     | 58°          | 54°                   |                                                                                                                             |
| "         | 10 A. M. | 26.265     | 60.5         | 60.5                  | Southerly winds, light clouds over the Peak.                                                                                |
| "         | 2 P. M.  | 26.203     | 62°          | 62°                   |                                                                                                                             |
| "         | 4 P. M.  | 26.182     | 61.5         | 62°                   | Light clouds.                                                                                                               |
| "         | 6 P. M.  | 26.201     | 60°          | 57°                   |                                                                                                                             |
| "         | 8 P. M.  | 26.256     | 60°          | 56°                   | Wind variable.                                                                                                              |
| 17th      | Min.     | ...        | ...          | 55°                   | Slight mist on the summit during night.                                                                                     |
| "         | 6 A. M.  | ...        | ...          | 56°                   |                                                                                                                             |
| "         | 8 A. M.  | 26.282     | 59°          | 57°                   | Strong northerly breeze blowing, while a marked upper southerly current of air passed close to the summits of the mountain. |
| "         | 2 P. M.  | 26.209     | 65.5         | 63.5                  |                                                                                                                             |
| "         | 4 P. M.  | 26.200     | 62°          | 63°                   |                                                                                                                             |
| "         | 6 P. M.  | 26.217     | 62°          | 60.5                  |                                                                                                                             |
| "         | 8 P. M.  | 26.253     | 62°          | 60°                   |                                                                                                                             |

*Catalogue of the plants collected in Behar and on Parasnath.*—By  
J. M. P. EDGEWORTH, ESQ., DRS. HOOKER, THOMSON, and T.  
ANDERSON.

# DICOTYLEDONES.

## I.—RANUNCULACEÆ.

*Naravelia Zeylanica*, DC., base of Parasnath.

*Clematis Gouriana*, Roxb., upper portion of Parasnath.

———— *nutans*, Royle, ditto ditto ditto.

*Thalictrum glyphocarpum*, W. and A., near the temple on Parasnath.

*Ranunculus sceleratus*, L.

## II.—DILLENIACEÆ.

*Dillenia speciosa*, Thunb.

———— *pentagyna*, Roxb., base of Parasnath.

## III.—ANONACEÆ.

*Polyalthia suberosa*, H. f. et Benth.

*Saccopetalum tomentosum*, H. f. et T., base of Parasnath.

## IV.—MENISPERMACEÆ.

*Tiliacora acuminata*, Miers.

*Cocculus villosus*, DC.

*Stephania hernandifolia*, Walp.

*Cissampelos Pareira*, L.

## V.—BERBERIDACEÆ.

*Berberis Asiatica*, Roxb., summit of Parasnath.

## VI.—NYMPHÆACEÆ.

*Nymphæa Lotus*, L.

———— *stellata*, Willd.

## VII.—NELUMBIACEÆ.

*Nelumbium speciosum*, Willd.

## VIII.—PAPAVERACEÆ.

*Papaver somniferum*, L.

*Argemone Mexicana*, L.

## IX.—FUMARIACEÆ.

*Fumaria parviflora*, Lam.

## X.—CRUCIFERÆ.

*Nasturtium Indicum*, L.

— *Benghalense*, DC.

*Cochlearia flava*, *Ham.*, banks of the Soane.

*Thlaspi arvense*, *L.*

*Lepidium sativum*, *L.*

*Sinapis juncea*, *L.*

*Brassica campestris*, *L.*

XI.—CAPPARIDACEÆ.

*Cleome monophylla*, *L.*

——— *pentaphylla*, *L.*

*Polanisia viscosa*, *DC.*

*Capparis horrida*, *L.*

XII.—FLACOURTIACEÆ.

*Flacourtia sepiaria*, *Roxb.*

——— *sapida*, *Roxb.*

——— *cataphracta*, *Roxb.*

*Casearia Hamiltonii*, *Wall.*

——— *tomentosa*, *Roxb.*

*Cochlospermum Gossypium*, *DC.*, Grand Trunk Road and base of Parasnath.

XIII.—POLYGALACEÆ.

*Salomonina oblongifolia*, *DC.*

*Polygala glaucescens*, *Wall.*, summit of Parasnath.

——— *oligophylla*, *DC.*

——— *arvensis*, *Willd.*

XIV.—VIOLACEÆ

*Ionidium suffruticosum*, *Ging.*

XV.—DROSERACEÆ.

*Drosera indica*, *L.*, summit of Parasnath.

XVI.—TAMARICACEÆ.

*Trichaurus ericoides*, *W. & A.*

XVII.—CARYOPHYLLACEÆ.

*Vaccaria parviflora*, *Moench.*

*Mollugo Cerviana*, *Ser.*

——— *striata*, *L.*

——— *triphylla*, *Lam.*

*Polycarpæa corymbosa*, *Lam.*

*Hapalosia Lœflingiae*, *Wall.*

*Drymaria cordata*.

XVIII.—LINACEÆ.

*Linum usitatissimum*, *L.*

*Reinwardtia trigyna*, *Planch.*, base of Parasnath.

XIX.—MALVACEÆ.

*Abutilon Indicum*, *Don.*

*Sida cordifolia*, *L.*

— *humilis*, *Willd.*

— *rhombifolia*, *L.*

— *acuta*, *L.*

*Abelmoschus moschatus*, *Moench.*

———— *cancellatus*, *Roxb.*

*Hibiscus Lampas*, *Cav.*

———— *rigidus*, *L.*

*Urena lobata*, *L.*

———— *repanda*, *Sm.*, Grand Trunk Road.

———— *sinuata*, *L.*, ditto ditto ditto.

*Lagunea lobata*, *Willd.*, ditto ditto ditto.

XX.—STERCULIACEÆ.

*Salmalia malabarica*, *Schott & Endl.*

*Helicteres Isora*, *L.*, base of Parasnath.

*Sterculia fœtida*, *L.*, lower forests of Parasnath.

———— *urens*, *Roxb.*, ditto ditto ditto.

*Firmiana colorata*, *R. Br.*, ditto ditto ditto.

*Melochia corchorifolia*, *L.*, Grand Trunk Road.

*Waltheria Indica*, *L.*

*Kydia calyoina*, *Roxb.*, Parasnath to 4,000 feet.

XXI.—BYTTNERIACEÆ.

*Byttneria herbacea*, *Roxb.*, Gyra.

*Eriolcena Hookeriana*, *W. & A.*, summit of Parasnath,

———— *spectabilis*, *Planch.*

XXII.—TILIACEÆ.

*Corchorus capsularis*, *L.*

———— *acutangulus*, *Lam.*

———— *olitorius*, *L.*

*Triumfetta pilosa*, *Roth.* ?

———— *angulata*, *Lam.*

*Grewia pilosa*, *Lam.*, summit of Parasnath.

———— *lævigata*, *Vahl.*, Grand Trunk Road.

*Grewia helicterifolia*, *Wall.*

—— *Asiatica*, *L.*, Grand Trunk Road and Parasnath.

—— *vestita*, *Wall.* ? summit of Parasnath.

XXIII.—DIPTEROCARPEÆ.

*Vatica robusta*, *W. & A.*, Grand Trunk Road.

XXIV.—OLACINÆÆ.

*Olax scandens*, *Roxb.*, base of Parasnath.

*Balanites Roxburghi*, *R. & S.*

XXV.—AURANTIACEÆ.

*Glycosmis pentaphylla*, *DC.*, Parasnath.

*Murraya exotica*, *L.*

*Feronia elephantum*, *Corr.*

*Ægle marmelos*, *Corr.*

XXVI.—MALPIGHIACEÆ.

*Hiptage madablota*, *Gærtn.*

XXVII.—SAPINDACEÆ.

*Cardiospermum Halicacabum*, *L.*

*Nephelium duriocarpus*, *Lour.*

*Schleichera trijuga*, *Willd.*, lower forests of Parasnath.

XXVIII.—MELIACEÆ.

*Melia Azedarach*, *L.*

*Azadirachta Indica*, *Adr. Juss.*, base of Parasnath.

*Mallea Rothii*, *Adr. Juss.*, summit of Parasnath.

XXIX.—CEDRELACEÆ.

*Chickrassia tabularis*, *Adr. Juss.*, Parasnath, from base to summit.

*Soymidia febrifuga*, *Juss.*

XXX.—AMPELIDÆÆ.

*Leea staphylea*, *Roxb.*

*Vitis adnata*, *Wall.* ?

—— *carnosa*, *Wall.*

—— *latifolia*, *Roxb.*

—— *tomentosa*, *Heyne.*

} Base and lower forests of Parasnath.

XXXI.—GERANIACEÆ.

*Geranium Nepalense*, *Sweet.*, summit of Parasnath.

XXXII.—OXALIDÆÆ.

*Oxalis corniculata*, *L.*

*Biophytum sensitivum*, *DC.*, base of Parasnath.

XXXIII.—BALSAMINEÆ.

*Impatiens Balsamina*, *L.*, upper forests of Parasnath.

XXXIV.—ZYGOPHYLLACEÆ.

*Tribulus terrestris*, *L.*

XXXV.—CELASTRINEÆ.

*Celastrus paniculata*, *Willd.*

———— *emarginata*, *Willd.*

*Elæodendron Roxburghii*, *W. & A.*

XXXVI.—RHAMNACEÆ.

*Zizyphus rugosa*, *Lam.*, upper forests of Parasnath.

———— *Xylopyra*, *Willd.* ?? base of Parasnath.

———— *Lotus*, *Lam.*

———— *Jujuba*, *Lam.* ? } Grand Trunk Road.

———— *Ænopila*, *Mill.* }

*Ventilago maderaspatana*, *Gaertn.*

*Catha edulis*, *Försk.* ?? Grand Trunk Road.

XXXVII.—TEREBINTHACEÆ.

*Mangifera Indica*, *L.*, below the temple on Parasnath.

*Semecarpus Anacardium*, *L.*

*Buchanania latifolia*, *Roxb.*, base of Parasnath and Trunk Road.

*Icica Indica*, *W. & A.*

*Garuga pinnata*, *Roxb.* } base of Parasnath.

*Odina Wodier*, *Roxb.* }

*Boswellia thurifera*, *Colebr.*

XXXVIII.—MORINGACEÆ.

*Moringa pterygosperma*, *Gaertn.*

XXXIX.—LEGUMINOSÆ.

*Crotalaria prostrata*, *Roxb.*

———— *acicularis*, *Ham.*, near Topechance.

———— *alata*, *Roxb.*

———— *sericea*, *Retz.*

———— *verrucosa*, *L.*

———— *juncea*, *L.*

———— *albida*, *Heyne.*

*Indigofera linifolia*, *Retz.*

———— *pentaphylla*, *L.* } Grand Trunk Road.

———— *hirsuta*, *L.* }

———— *pulchella*, *Roxb.*, from 2,000 feet elevation to summit of Parasnath.

- Indigofera trita, *L.*
- Psoralia corylifolia, *L.*
- Sesbania ægyptiaca, *L.*
- Tephrosia purpurea, *Pers.*
- Lathyrus sativa, *L.*
- Smithia sensitiva, *Ait.*
- ciliata, *Royle.*, summit of Parasnath.
- conferta, *Sm.*
- Zornia angustifolia, *Sm.*
- Æschynomene Indica, *L.*
- Ougenia dalbergioides, *Benth.*, summit of Parasnath.
- Alysicarpus vaginalis, *DC.*
- nummularifolius, *DC.*
- bupleurifolius, *DC.*
- scariosus, *Grah.*
- Uraria lagopoides, *DC.*
- hamosa, *Wall.*
- ? styracifolia, *W. & A.*
- Dendrolobium cephalotis, *Benth.*
- Desmodium triflorum, *DC.*, Grand Trunk Road.
- polycarpum, *DC.*, from the base to summit of Parasnath.
- gyrans, *DC.*
- latifolium, *DC.*, from the base to 2,000 feet on Parasnath.
- diffusum, *DC.*, lower forests of Parasnath.
- gangeticum, *DC.*, on Parasnath.
- retroflexum, *DC.*, Var.
- Phyllodium pulchellum, *Devs.*, base of Parasnath.
- Dumasia congesta, *Grah.*
- Pueraria tuberosa, *DC.*
- Alhagi maurorum, *L.*, Grand Trunk Road.
- Glycine labialis, *W. & A.*, base of Parasnath.
- Canavalia gladiata, *DC.*
- Mucuna pruriens, *Wall.*
- Erythrina Indica, *Lam.*
- sublobata, *Roxb.*
- Butea frondosa, *Roxb.*

} Along the Grand Trunk Road.



*Butea parviflora*, *Roxb.*

*Lablab vulgaris*, *Savi.*

*Phaseolus sublobatus*, *Roxb.*

———— *sp. proxima* *P. alato*, *Roxb.*, Parasnath.

*Atylosia scarabæoides*, *Benth.*, Grand Trunk Road.

*Rhynchosia minima*, *DC.*

*Flemingia strobilifera*, *R. Br.*, Parasnath.

———— *semialata*, *Roxb.*

———— *angustifolia*, *Roxb.*, Parasnath.

———— *cordifolia*, *Wall.*

*Abrus precatorius*, *L.*

*Otosema macrophylla*, *Benth.*

*Pongamia glabra*, *Vent.*

*Dalbergia latifolia*, *Roxb.*

———— *Sissoo*, *Roxb.*

———— *frondosa*, *Roxb.*

———— *paniculata*, *Roxb.*

———— *confertiflora*,

*Sophora heptaphylla*, *L.* ? ?

*Guilandina bonducella*, *L.*

*Mezoneuron cucculatum*.

*Cassia occidentalis*, *L.*

———— *tora*, *L.*

———— *mimosoides*, *L.*

*Tamarindus Indica*, *L.*

*Phanera purpurea*, *Benth.*

———— *variegata*, *Benth.*

———— *retusa*, *Benth.*

———— *VahlII*, *Benth.*

*Piliostigma malabaricum*, *Benth.*

———— *racemosum*, *Benth.*

*Hardwickia binata*, *Roxb.*, upper Soane valley.

*Adenanthera Pavonina*, *L.*

*Mimosa rubicaulis*, *Lam.*

*Acacia Farnesiana*, *Willd.*

———— *Catechu*, *Willd.*

———— *cæsia*, *W. & A.*

———— *pennata*, *Willd.*

*Albizzia odoratissima*, *Benth.*

——— *amara*, *Bois.*

——— *procera*, *Benth.*

XL.—ROSACEÆ.

*Potentilla supina*, L. banks of the Soane.

*Pygeum lucidum*, T. Anders., MSS., summit of Parasnath at 4,300 feet elevation.

XLI.—COMBRETACEÆ.

*Conocarpus latifolia*, *Roxb.*

*Terminalia belerica*, *Roxb.*

——— *chebula*, *Roxb.*

——— *Catappa*.

——— *citrina*, *Roxb.*

*Pentaptera tomentosa*.

——— *Arjuna*, *Roxb.* ?

*Poivreia Roxburghii*, *DC.*

*Combretum nanum*, *Ham.*, Grand Trunk Road.

XLII.—MELASTOMACEÆ.

*Osbeckia angustifolia*, *Don.*, summit of Parasnath.

——— *muralis* *Naud.*, ditto ditto.

XLIII.—ALANGIACEÆ.

*Alangium decapetalum*, *Lam.*, Grand Trunk Road.

XLIV.—MYETACEÆ.

*Eugenia Jambolana*, *Lam.*, Parasnath from the base to the summit.  
sp. summit of Parasnath.

*Barringtonia acutangula*, *Roxb.*

XLV.—LYTHRACEÆ.

*Jussiaea repens*, *L.*

——— *villosa*, *Lam.*

——— *angustifolia*, *Lam.*

*Ludwigia parviflora*, *Roxb.*

} From the base of Parasnath to an  
elevation of 4,000 feet in wet places  
near the Grand Trunk Road.

*Grislea tomentosa*, *Roxb.*, Grand Trunk Road & base of Parasnath.

*Lagerstromia parviflora*, *Roxb.*, base of Parasnath.

*Ameletia Indica*, DC.

———— *tenuis*, Wt.

*Ammannia glauca*, Wall.

———— *vesicatoria*, Roxb. } In rice fields near the Grand

———— *multiflora*, Roxb. } Trunk Road at Topechancee.

———— *pentandra*, Roxb.

———— *rotundifolia*, Ham.

XLVI.—CUCURBITACEÆ.

*Trichosanthes dioica*, Roxb.

———— *cucumerina*, L., base of Parasnath.

*Bryonia scabrella*, L.

———— *umbellata*, Koen., summit of Parasnath.

———— *laciniosa*, L., on the Grand Trunk Road.

*Coccinia Indica*, W. & A.

XLVII.—CRASSULACEÆ.

*Kalanchoe floribunda*, W. & A., summit of Parasnath.

*Bryophyllum calycinum*, Salisb.

XLVIII.—UMBELLIFERÆ.

*Umbellifera* (undeterminable,) summit of Parasnath.

XLIX.—ARALIACEÆ.

*Aralia digitata*, Roxb., summit of Parasnath.

———— sp., on Parasnath at 4,000 feet elevation.

———— sp., on Parasnath at 2,000 feet elevation.

L.—LORANTHACEÆ.

*Viscum orientale*, Willd.

———— *attenuatum*, DC. } at the base of Parasnath.

*Loranthus buddleoides*, W. & A., from the base to the summit  
of Parasnath.

———— *bicolor*, Roxb., base of Parasnath.

LI.—RUBIACEÆ

*Nauclea parviflora*, Roxb., } forests on the base of Parasnath.

———— *cordifolia*, Roxb., }

*Hymenodyction excelsum*, Wall., on Parasnath at 2,000 feet elevation.

*Gardenia latifolia*, Ait.

———— *campanulata*, Roxb. } base of Parasnath.

———— *turgida*, Roxb.

———— *montana*, Roxb.

*Randia longispina*, DC.

——— *uliginosa*, DC.

*Wendlandia tinctoria*, DC.

——— *exserta*, DC.

*Dentella repens*, Forst., moist places on the Grand Trunk Road.

*Hedyotis scandens*, Roxb.

——— *calycina*, Wall.

——— *pinifolia*, Wall.

*Oldenlandia racemosa*, Lam.

——— *Burmänniana*, R. Br.

*Vanuæria spinosa*, Roxb., base of Parasnath.

*Hamiltonia suaveolens*, Roxb., summit of Parasnath.

*Ixora undulata*, Roxb., forests at the base of Parasnath.

——— *parviflora*, Vahl., near Gya on the Grand Trunk Road.

*Pavetta tomentosa*, Sm., at the base of Parasnath.

*Bigelowia lasiocarpa*, W. & A., from the base to the summit of Parasnath.

*Spermacoce articularis*, L.

*Knoxia cosymbosa*, Willd.

——— n. sp.

*Rubia cordifolia*, L., on Parasnath.

#### LII.—COMPOSITÆ.

*Vernonia saligna*, DC., on Parasnath (found only by Dr. Hooker.)

——— *rigiophylla*, DC., at the base of Parasnath.

——— *divergens*, H. f. et. T., near the summit of Parasnath.

——— *aspera*, DC.

——— *cinerea*, Less.

——— *anthelmintica*, Willd.

*Elephantopus scaber*, L.

*Adenostemma latifolium*, DC., summit of Parasnath.

*Sphæranthus hirtus*, Willd.

*Grangea Madraspatana*, Poir.

*Cyathocline lyrata*, Cass.

*Conyza viscidula*, Wall.

——— *veronicæfolia*, DC.

*Blumea amplexans*, DC.

——— *Wightiana*, DC.

——— *lacera*, DC.

*Blumea runcinata*, DC.

———— *virens*, DC.

———— *flava*, DC.

———— *aurita*, DC.

———— *oxyodonta*, DC.

———— *glomerata*, DC.

———— *alata*, DC.

*Vicoa Indica*, Wt.

*Francœuria crispa*, Cass.

*Cæulia axillaris*, Roxb.

*Eclipta alba*, Hassk.

*Blainvillea latifolia*, DC.

*Glossocardia Boswellii*, DC.

*Bidens pilosa*, L.

———— *bipinnata*, L.

*Glossogyne pinnatifida*, DC.

*Wedelia urticæfolia*, DC.

*Siegesbeckia orientalis*, L.

*Myriœgyne minuta*, DC.

*Artemisia parviflora*, Roxb.

*Senecio* sp. not determinable, summit of Parasnath.

*Gnaphalium luteo-album*, L.

———— *crispatulum*, Del.

———— *indicum*, L.

*Emelia sonchifolia*, DC.

*Sonchus arvensis*, L.

*Youngia runcinata*, DC.

*Echinops echinatus*, Roxb.

*Tricholepis Candolleana*, Wt.

*Microrhynchus ruderalis*, Less.

———— *asplenifolius*, DC.

#### LIII.—CAMPANULLACEÆ.

*Cephalostigma hirsutum*, A. DC.

———— *paniculatum*, A. DC.

*Campanula canescens*, Wall.

*Wahlenbergia agrestis*, A. DC.

*Lobelia trigona*, Roxb.

*Micropyxis pumila*, Duby., summit of Parasnath.

## LIV.—MYRSINACEÆ.

*Embelia robusta*, *Roxb.*, lower forests to the summit of Parasnath.  
*Ardisia humilis*, *Vahl.*, ditto ditto ditto.

## LV.—EBENACEÆ.

*Diospyros tomentosa*, *Roxb.*  
 ——— *cordifolia*, *Roxb.*  
 ——— *exculpta*, *Ham.*

## LVI.—SAPOTACEÆ.

*Bassia butyracea*, *Roxb.*

## LVII.—JASMINACEÆ.

*Nyctanthes arbor-tristis*, *L.*, lower forests of Parasnath.

## LVIII.—OLEACEÆ.

*Olea Roxburghii*, *R. & S.*, summit of Parasnath.

## LIX.—STYRACACEÆ.

*Symplocos Hamiltonianus*, *Herb. Strach. et Winter*, Gyra.

## LX.—APOCYNACEÆ.

*Carissa Carandas*, *L.*  
*Vallis dichotoma*, *Vahl.*  
*Wrightia tomentosa*, *DC.*, at the base of Parasnath.  
*Holarrhena antidysenterica*, *Wall.*  
*Ichnocarpus frutescens*, *R. Br.*  
*Vinca pusilla*, *Murr.* Gyra on the Grand Trunk Road.

## LXI.—ASCLEPIADACEÆ.

*Hemidesmus Indicus*, *R. Br.*  
*Cryptblepis Buchananii*, *R. et S.*  
*Cynoctonum Callialata*, *Dene.*, at the summit of Parasnath.  
*Calotropis gigantea*, *R. Br.*  
*Asclepias curassavica*, *L.*  
*Gymnema hirsutum*, *W. & A.*  
*Hoya pendula*, *W. & A.*, from the base to 3,500 feet on Parasnath.  
*Ceropegia* sp. undeterminable, summit of Parasnath.

## LXII.—LOGANIACEÆ.

*Strychnos potatorum*, *L. fil.*

## LXIII.—GENTIANACEÆ.

*Exacum pedunculatum*, *L.*  
 ——— *petiolare* *Grieseb.*, summit of Parasnath.  
*Pladera pusilla*, *Roxb.*

*Canscora diffusa*, *R. Br.*

———— *decussata*, *R. et S.*

LXIV.—BIGNONIACEÆ.

*Heterophragma Roxburghii*, *DC.*? Forest at the base of Parasnath.

*Stereospermum chelonoides*, *DC.*? Forest at the base of Parasnath.

*Schrebera Swietenoides*, *Roxb.*

LXV.—PEDALIACEÆ.

*Sesamum Indicum*, *L.*

*Martynia diandra*, *Glox.*

LXVI.—CYRTANDRACEÆ.

*Æschynanthus*, sp., summit of Parasnath.

*Rhynchoglossum obliquum*, *DC.*, summit of Parasnath.

LXVII.—HYDROPHYLLACEÆ.

*Hydrolea Zeylanica*, *Vahl.*, along the Grand Trunk Road.

*Sphenoclea Zeylanica*, *L.*

LXVIII.—CONVOLVULACEÆ.

*Rivea hypocrateriformis*, *Chois.*

———— *Bona Nox*, *Chois.*

*Argyreia setosa*, *Chois.*

*Pharbitis Nil*, *Chois.*, summit of Parasnath.

*Ipomœa reptans*, *Poir.*

———— *reniformis*, *Chois.*

———— *tridentata*, *Roth.* Gyra.

———— *pestigridis*, *L.*

———— *sessiliflora*, *Roth.*

———— *obscura*, *Kerr.*

———— *sepiaria*, *Kæn.*, Topechancee.

*Convolvulus pluricaulis*, *Chois.*

*Porana paniculata*, *Roxb.*, on Parasnath to an elevation of 2,000 feet.

*Evolvulus alsinoides*, *L.*

*Erycibe paniculata*, *Roxb.*

*Cuscuta reflexa*, *Roxb.*

LXIX.—CORDIACEÆ.

*Cordia polygama*, *Roxb.*?

———— sp. (an *C. Macleodii* H. f. et T.) Gyra.

*Ehretia lævis*, *Roxb.*

——— *ovalifolia*, *Wight.*

——— *viminea*, *Wall.*

#### LXX.—BORRAGINÆÆ.

*Coldenia procumbens*, *L.*

*Bothriospermum tenellum*, *Fisch et Mey.*

*Cynoglossum micranthum*, *Desf.*, from 2,000 feet to the summit of Parasnath.

*Trichodesma Indicum*, *R. Br.*

——— *Zeylanicum*, *R. Br.*

#### LXXI.—SOLANACEÆ.

*Solanum Xanthocarpum*, *Schrad.*

——— *torvum*, *Swartz.*

#### LXXII.—SCROPHULARINÆÆ.

*Celsia coromandeliana*, *Vahl.*

*Linaria ramosissima*, *Wall.*

*Alectra Indica*, *Bth.*, towards the summit of Parasnath.

——— *squamosa*, *T. Anders. MSS.*, from 1—3,000 feet elevation on Parasnath. Parasitic on roots of *Strobilanthes auriculatus*.

*Mazus rugosus*, *Lour.*

*Lindenbergia urticæfolia*, *Lehm.*, Parasnath to 4,000 feet elevation.

*Limnophila gratioloides*, *R. Br.*

*Herpestes Hamiltoniana*, *Benth.*, Topechancee.

——— *Monniera*, *H. B. K.*

*Torenia cordifolia*, *Roxb.* } Grassy places on the summit of Paras-  
——— *sp. (an nova.)* } nath.

*Vandellia crustacea*, *Bth.*

——— *erecta*, *Bth.*

——— *nummularifolia*, *Don.*

*Ilysanthes parviflora*, *Bth.*

*Bonnaya brachiata*, *Link., et Otto.*

——— *veronicæfolia*, *Spreng.*

——— *verbenæfolia*, *Spreng.*

*Glossostigma spathulatum*, *Arn.*

*Scoparia dulcis*, *L.*

*Buddleia asiatica*, *Lour.*

*Buchnera hispida*, *Ham.*, above 4,000 feet on Parasnath.

*Striga euphrasioides*, *Bth.*



*Sopubia delphinifolia*, *G. Don.*, in pools of water along the Grand Trunk Road.

*Centranthera hispida*, *R. Br.*

————— *humifusa*, *Wall.*

LXXIII.—OROBANCHACEÆ.

*Phelipæa Indica*, *G. Don.*

*Æginetia Indica*, *Roxb.*

LXXIV.—LENTIBULARIACEÆ.

*Utricularia stellaris*, *L.*

————— *sp.*

————— *sp.*

} In a marshy place near Gyra.  
,

LXXV.—ACANTHACEÆ.

*Nelsonia tomentosa*, *Willd.*

*Adenosma triflora*, *N. ab E.*

*Hygrophila salicifolia*, *N. ab E.*

————— *spinosa* *T. Anders.*

*Ruellia cernua*, *Roxb.*, lower forests of Parasnath.

*Petalidium barlerioides*, *N. ab E.*, base of Parasnath.

*Hemiographis elegans*, *N. ab E.*

*Strobilanthes auriculatus*, *N. ab E.*

*Dædalacanthus purpurascens*, *T. Anders.* from the base to the summit of Parasnath.

*Barleria cœrulea*, *Roxb.*

————— *cristata*, *L.*

*Lepidagathis hyalina*, *N. ab E.*

————— *cristata*, *Willd.*, along the Grand Trunk Road.

-- *striata*, *N. ab E.*

*Andrographis paniculata*, *N. ab E.*

————— *echioides*, *N. ab E.*

*Justicia Adhatoda*, *L.*

————— *Betonica*, *L.*

————— *procumbens*, *L.*

*Peristrophe bicalyculata*, *N. ab E.*

*Rungia parviflora*, *N. ab E.*

*Dicliptera bupleuroides*, *N. ab E.?*

————— *micrantha*, *N. ab E.*, *Topechancee.*

LXXVI.—VERBENACEÆ.

*Callicarpa arborea*, *Roxb.*, lower forests of Parasnath.

*Clerodendron serratum*, *Spreng.*, at the base of Parasnath.

————— *infortunatum*, *L.*

*Vitex Negundo*, *L.*, Gya.

———— *peduncularis*, *Wall.*, at the base of Parasnath.

#### LXXVII.—LABIATÆ.

*Ocimum Basilicum*, *L.*

*Acrocephalus capitatus*, *Benth.*

*Orthosiphon rubicundus*, *Benth.*, Topechancee.

*Plectranthus ternifolius*, *Don.*

———— *cordifolius*, *Don.*

*Coleus barbatus*, *Benth.*

*Anisochilus carnosus*, *Wall.*

———— *eriocephalus*, *Benth.*, Kymore hills *J. D. Hooker.*

*Pogostemon plectranthoides*, *Desf.*

*Dysophylla verticellata*, *Benth.*

*Colebrookia oppositifolia*, *Smith.*

*Calamintha umbrosa*, *Benth.* ?

*Nepeta ruderalis*, *Hamilt.*

*Anisomeles ovata*, *R. Br.*, summit of Parasnath.

*Leucas lanata*, *Benth.*

———— *mollissima*, *Wall.*

———— *pilosa*, *Benth.*

———— *aspera*, *Spreng.*

———— *nutans*, *Spreng.*

———— *cephalotes*, *Spreng.*

———— *linifolia* *Spreng.*

*Leonotis nepetæfolia*, *R. Br.*

*Teucrium decumbens*.

*Ajuga macrosperma*, *Wall.* ? summit of Parasnath.

#### LXXVIII.—PLUMBAGINACEÆ.

*Plumbago Zeylanica*, *L.*

#### LXXIX.—LAURACEÆ.

*Cassythia filiformis*, *L.* along the Grand Trunk Road.

*Tetranthera* (an *T. apetala*.)

#### LXXX.—POLYGONACEÆ.

*Rumex* <sup>\*</sup>*dentatus*, *Campd.*

———— *vesicarius*, *L.*

*Polygonum herniarioides*, *Delile.*

*Polygonum glabrum*, Willd.

———— chinense, *L.*, from the base to the summit of Parasnath.

———— Roxburghii, *Meisn.*

———— flaccidum, *Roxb.*, on Parasnath at elevation 4000 feet.

———— barbatum, *L.*, Gyra and Topechancee.

———— Nepalense, *Meisn.*, towards the summit of Parasnath.

LXXXI.—CHENOPODIACEÆ.

*Chenopodium album*, *L.*

LXXXII.—AMARANTACEÆ.

*Derringia celosioides*, *R. Br.*

*Celosia argentea*, *L.*

*Amarantus spinosus*, *L.*

*Erva scandens*, *Wall.*, on Parasnath at 4000 feet elevation.

———— lanata, *Juss.*

*Achyranthes aspera*, *L.*

———— bidentata, *Blume.*, from the base to the summit of

Parasnath.

*Pupalia lappacea*, *Mog.*

*Alternanthera sessilis*, *R. Br.*

LXXXIII.—NYCTAGINEÆ.

*Boerhaavia diffusa*, *L.*

LXXXIV.—PIPERACEÆ.

*Peperomia reflexa*, *A. Dietr.* on trees at 4000 feet elevation on Parasnath.

LXXXV.—STILAGINACEÆ.

*Antidesma diandrum*, *Spreng.*

———— paniculatum, *Spreng.*

LXXXVI.—SCEPACEÆ.

*Lepidostachys Roxburghii*, *Wall.*

LXXXVII.—URTICACEÆ.

*Trophis aspera*, *Willd.*

*Urtica heterophylla*, *Roxb.*

*Bhœmeria*, sp., on Parasnath.

*Urostigma religiosum*, *Guss.*

———— bengalense, *Guss.*

———— tomentosa, *Guss.*

———— comosum, at 2,500 feet elevation on the Northern slope of Parasnath.

*Ficus parasitica*, *Koen.*

——— *scandens*, *Roxb.*

*Covellia cunea*, *Miq.*

*Artocarpus Lacucha*, *Roxb.*

#### LXXXVIII.—ULMACEÆ.

*Sponia orientalis*, *Endl.*

*Ulmus integrifolia*, *Roxb.*

#### LXXXIX.—EUPHORBIACEÆ.

*Euphorbia chamæsyce*, *Willd.*

——— *Indica*, *Lam.*

——— *Nivulia*, *Ham.*

——— *uniflora*, *Roxb.*

*Microstachys chamelea*, *Juss.*

*Tragia*, along the Grand Trunk Road.

*Acalypha Indica*, *Willd.*, (fid. Edgew.)

*Baliospermum polyandrum*, *Wight.*

*Rottlera tinctoria*, *Roxb.*

*Trewia nudiflora*, *Linn.*

*Croton oblongifolia*, *Roxb.*

*Crozophora Rottleri*, *Juss.*

*Emblica officinalis*, *Gært.*

*Phyllanthus urinarius*, *Willd.*

——— *simplex*, *Willd.*

——— *Niruri*, *Linn.*

——— *polyphyllus*, *Wight.*

*Anisonema multiflorum*, *Wight.*

*Bradleia* (52 herb. Hook. et cat.)

*Briedelia montana*, *Willd.*

——— *spinosa*, *Willd.*

——— No. 16 herb Hook. et cat.

*Melanthesa Vitis idæa*, *Koen.*

#### MONOCOTYLEDONES.

##### XC.—PALMEE.

*Phoenix sylvestris*, *Roxb.*

——— *acaulis*, *Roxb.*

*Borassus flabelliformis*, *Linn.*

##### XCI.—AROIDEÆ.

*Remusatia vivipara*, *Schott.*

## XCII.—Najadeæ.

*Najas minor*, *All.*

*Zanichellia palustris*, *Linn.*

## XCIII.—Juncagineæ.

*Potamogeton natans*, *Linn.*

———— *hybridus*, *Mx.*

———— *crispus*, *Linn.*

———— *pectinatus*, *Linn.*

## XCIV.—Hydrocharideæ.

*Hydrilla dentata*, *Casp.*

*Vallisneria spiralis*, *Linn.*

*Ottelia alismoides*, *DC.*

## XCV.—Scitamineæ.

*Globba bulbifera*.

*Zingiber capitatum*, *Roxb. ?*

———— *roseum*, *Roxb. ?*

———— *cassumunar*, *Roxb. ?*

*Alpinia*, *sp.*

*Curcuma*, *sp.*

## XCVI.—Orchideæ.

*Oberonia*, *sp.*, on rocks near the summit of Parasnath, J. D. Hooker.

*Malaxis Walkeriana*, *Grah. ?*

*Dendrobium ramosissimum*, *Wight.*, near the summit of Parasnath.

———— *sp.*, undetermined.

*Vanda Roxburghii*, *R. Br.*

*Eulophia graminea*, *Lindl.*

*Calanthe*, *sp.*

*Habenaria plantaginea*, *Lindl.*

———— *commelinifolia*, *Wall.*

———— *sp.*

} towards the upper part of  
Parasnath,

*Zeuxine sulcata*, *Lindl.*

## XCVII.—Burmanniaceæ.

*Burmannia*, *sp.*, near Gyra on the Grand Trunk Road,

## XCVIII.—Hypoxideæ.

*Curciligo recurvata*, *Don.*

———— *orchidoides*, *Gaertn.*

*Hypoxis minor*, *Don.*

## XCIX.—Dioscoreideæ.

*Dioscorea glabra*, *Roxb.*

## C.—LILIACEÆ.

- Smilax ovalifolia*, *Roxb.*  
*Iphigenia indica*, *Kunth.*  
*Asphodelus fistulosus*, *Linn.*  
*Chlorophytum attenuatum*, *Wight.*  
*Asparagus racemosus*, *Roxb.*

## CI.—MELANTHACEÆ.

- Disporum Leschenaultianum*, *Don.*

## CII.—COMMELYNACEÆ.

- Commelyna salicifolia*, *Roxb.*  
 ———— *communis*, *Linn.*  
 ———— *benghalensis*, *Linn.*  
*Aneilema nudiflorum*, *R. Br.*  
 ———— *nana*, *Kunth*  
 ———— *latifolia*, *Wight.*  
 ———— *vaginata*, *Wall.*  
*Cyanotis cristata*, *R. & S.*

## CIII.—JUNCACEÆ.

- Juncus Leschenaultii*, *J. Gay.*

## CIV.—RESTIACEÆ.

- Eriocaulon trilobum*, *Ham.*

## CV.—CYPERACEÆ.

- Papyrus Pangorei*, *Rottb.*  
*Cyperus flavescens*, *Linn.*  
 ———— *umbellatus*, *Benth.*  
 ———— *pygmaeus*, *Vahl.*  
 ———— *difformis*, *Linn.*  
*Lipocarpa lævigata*, *N. ab E.*  
*Hermicarpha Isolepis*, *N. ab E.*  
*Fimbristylis pallescens*, *N. ab E.*  
*Trichelostylis scabra*, *N. ab E.*  
 ———— *junciformis*, *N. ab E.*  
*Isolepis squarrosa*, *Vahl*  
 ———— *supina*, *R. Br.*  
 ———— *prolongata*, *N. ab E.*  
 ———— *trifida*, *N. ab E.*  
*Scirpus affinis*, *Rottb.*  
 ———— *capitatus*, *Willd.*  
*Fuirena glomerata*, *Lam.*

*Scleria lithosperma*, Willd., on Parasnath.

*Carex speciosus*, Kunth.

CVI.—GRAMINEÆ.

*Oryza sativa*, Linn.

——— *granulata*, N. ab E.

*Zea majus*, Linn., (cult.)

*Coix lachryma*, Linn. near the temple on Parasnath.

*Paspalum scrobiculatum*, Linn.

——— *brevifolium*, Flügge.

——— *pedicellatum*, N. ab E.

*Milium sanguinale*, Roxb.

——— *filiforme*, Roxb.

*Lappago racemosa*, Willd.

*Eriochloa annulata*, Kunth.

*Coridochloa fimbriata*, N. ab E.

*Digitaria sanguinalis*.

*Pennisetum cenchroides*, Rich.

*Panicum colonum*, Linn.

——— *compositum*, Linn.

——— *glaucum*, Linn.

——— *sarmentosum*, Roxb.

——— *montanum*, Roxb.

——— *plicatum*, Lam.

——— *humile*, N. ab E.

——— *costatum*, Roxb.

——— *fluitans*, Roxb.

——— *uliginosum*, Roxb.

——— *setigerum*, Roxb.

*Isachne australis*, R. Br. ?

*Thysanolaena acarifera*, N. ab E.

*Arundinella Wallichii*, N. ab E.

——— *setosa*, Trin.

——— *nepalensis*, Trin.

*Menisthea lævis*.

*Rottboellia*, sp.

*Manisuris granularis*, Linn.

*Perotis latifolia*, Ait.

*Dimeria tenera*, Trin. ?

*Imperata arundinacea*, Cyr.

- Saccharum spontaneum*, *Linn.*  
 ———— *procerum*, *Roxb.*  
 ———— *Sara*, *Roxb.*  
*Pollinia villosa*, *Munro Mss.*  
 ———— *sp. an P. tenuis*, *Trin.*  
*Pogonatherum*, *sp.*  
*Anthistiria scandens*, *Roxb.*  
 ———— *Wightii*, *N. ab E.*  
*Androscepiæ gigantea*, *Brongn.*  
*Apluda aristata*, *Linn.*  
 ———— *communis*, *N. ab E.*  
 ———— *filiformis*.  
*Anatherum muricatum*, *Pal. de Beauv.*  
*Schizachrysum brevifolium*, *N. ab E.*  
*Cymbopogon pachnodes*, *Trin.*  
*Sorghum muticum*, *var. tropicum*, *N. ab E.*  
*Andropogon annulatus*, *Forsk !*  
 ———— *ischæmum*.  
 ———— *pertusus*, *Willd.*  
 ———— *strictus*, *Roxb.*  
 ———— *halapensis*.  
       — *lancifolius*, *Trin.*  
       — *lanceolatus*, *Roxb.*  
*Heteropogon hirtus*, *Pers.*  
*Chrysopogon villosulus*, *N. ab E.*  
 ———— *montanus*, *Roxb.*  
*Sporobolus Wallichii*, *Munro Mss.*, (Wall. Cat. 3769.)  
 ———— *pulchellus*, *R. Br.*, (Wall. Cat. 8883.)  
*Polypogon littoralis*, *Sm.*  
*Aristida cœrulescens*, *Desf.*  
*Arundo Madagascariensis*, *Kunth.*  
 ———— *Roxburghii*, *Kunth.*  
*Schœnefeldia pallida*, *Edgew.*  
*Cynodon Dactylon*, *Pers.*  
*Dactyloctenium ægyptiacum*, *Willd.*  
*Chloris barbata*, *Sw.*  
*Leptochloa cynosuroides*, *R. & S.*  
*Avena fatua*, *Linn.*  
*Eragrostis bifaria*, *W. & A.*



*Eragrostis cynosuroides*, *Retz.*

———— *multiflora*, *N. ab E.*

———— *unioloides*, *N. ab E.*

———— *Brownei*, *N. ab E.*

———— *verticellata*, *Pal. de Beauv.*

———— *nutans*, *Roxb.*

———— *cylindrica*, *N. ab E.*

· *plumosa*, *Link.*

*Tripogon bromoides*, *R. & S.*

*Elytrophorus articularis*, *Pal. de Beauv.*

*Dendrocalamus strictus*, *N. ab E.*

*Bambusa*, *sp.*

#### CRYPTOGAMÆ.

##### CVII.—MARSILEACEÆ.

*Marsilea quadrifolia*, *L.*

*Azolla pinnata*, *R. Br.*

##### CVIII.—POLYPODIACEÆ.

*Goniopteris*.

*Pleopeltis*.

*Niphobolus*.

*Cheilanthes farinosa*, *Kaulf.*

———— *tenuifolia*, *Sw.*

*Adiantum lunulatum*, *Burm.*

*Pteris Wightiana*, *Wall.*

*Asplenium furcatum*, *Linn.*

*Nephrodium*.

*Lastraea*, *sp.*

*Sagenia*, *sp.*

*Leucostegia*, *sp.*

*Ceratopteris thalictroides*, *Brongn.*

*Lygodium scandens*, *Sw.*

##### CIX.—OPHIOGLOSSACEÆ.

*Ophioglossum vulgatum*, *Linn.*

##### CX.—LYCOPODIACEÆ.

*Lycopodium*, *sp.*

———— *sp.*

*Selaginella*, *sp.*

*Memoranda on the Peshawur Valley, chiefly regarding its Flora.—**By J. L. STEWART, ESQ., M. D.*

The Peshawur valley, from its position between two great botanical regions, the Oriental and the Indian, possesses greater interest in the eyes of botanists than its meagre Flora would otherwise entitle it to, and as no account of its botany has been published, I have been induced to arrange for publication all that I was able to collect on this and some allied subjects during several years' residence there.

So far as I am aware, but little had been done in botanizing in the district previous to 1856. Griffith had at various times spent a few days at Peshawur, during our occupation of Affghanistan in 1839-40. Dr. T. Thomson also had visited it about the same time, and some ten years later a collection of Peshawur plants, with the extent of which I am unacquainted, had been made by Major Vicary of the Bengal Army.

Under these circumstances, I am fortunate in having had it in my power to botanize pretty extensively in the valley, in which and its neighbourhood, I resided from July 1856 to February 1861, (with the exception of eight months in 1857, when I was absent on service at Delhi). During that period I was able to avail myself of several opportunities for visiting places that are not readily accessible to the European traveller, who, in that district, if he stray beyond cantonments, runs a chance of being shot by some fanatic Mussalman, wishing to gain a cheap entrance to Paradise by murdering a Faringí. Near the cantonment of Peshawur, this risk is greatest towards the Khaiber pass, and towards Fort Bárá, and the police have strict orders to watch over any European going to even a short distance in either of these directions.

During the greater part of the time I have mentioned, I resided at Peshawur itself, but I was also stationed for shorter periods at Murdán, Nowshera, Attock and Campbellpore, (and although the last is a few miles Cis-Indus, its Flora is almost identical with that of the Peshawur valley, and may well be included in it.). Opportunities also occurred of traversing part of the Chingláí hills to the North East of the valley, with the Expedition under General Cotton in April and May, 1858, when we reached about 5,000 feet above the sea; of herborizing on

Mount Mitú near Attock, 2,500 feet, the hill at the Cheraát Pass in the Khattak country, 4,700 feet, and various lower spurs near Murdán, Abazái and Michní. I had occasion to traverse the Kohát Pass repeatedly; so that I have had fair opportunities of becoming acquainted with the Flora of the district.

The city and cantonment of Peshawur, which lie towards the Western extremity of the valley of that name, are situated in Long.  $71^{\circ} 33'$  E. and Lat.  $34^{\circ}$  N. at an elevation of nearly 1,200 feet above the sea, and no part of the valley is much above or below this height, although there is a slight rise on all sides towards its edges, and although the level of the Indus at Attock, near which the drainage of the district issues in the Cabul river, is only about 1,000 feet above the sea. All the inequalities of the flat part of the valley will probably be included in from 1,000 to 1,500 feet above the sea.

The valley itself, which constitutes the most Northern part of the long strip of territory comprised in our Trans-Indus possessions and may be described as a broad oval, lying in a north-east and south-west direction, is about 60 miles long and nearly 40 broad. Its chief divisions, which however are more political than geographical, may be enumerated as follows:—*Eusofzái*; the most North-eastern part of the district situated to the North of the junction of the Indus and Cabul rivers,—*Ashnagar*, to the West of Eusofzái, and between it and the Swát river,—the *Doábá* between the latter and the Cabul river,—the *Daoodzái* and the *Khalíl* to the North and West of the city of Peshawur, and *the southern strip of the district, inhabited chiefly by the lower Momands and part of the Khattaks.*

There are no lakes in the district, but in many places there are large marshes (for instance an extensive one close to Peshawur,) and large tracts, particularly in the Doábá, become marshes after much rain. A curious phenomenon is noted on the maps at a place near Topí in the eastern Eusofzái, where it is stated that a lake of several miles in extent is formed after every eight or ten years. In 1858, I passed over the locality with the force under General Cotton, and found that such a tradition is held by the inhabitants. The part, where the lake is said to be formed, is low, and was then (in May) verdant and almost marshy, water being abundant in pits at 6 and 8 feet from the surface. A small, sluggish stream runs through the tract, and from all I can learn, the so-called "lake" is merely a

marsh formed on this low ground, in seasons of excessive rain, the water, however, never being so deep as to quite conceal the tall grass and reeds.

The principal streams of the valley are three, of which the chief is the Cabul river, the largest affluent of the Indus during its whole course above its junction with the Panjnad at Mittun Kote. This river, which, as well as the next, is called Lúndí, debouches from the Khaiber range a little above the village and fort of Michní, and follows an easterly course for about fifty miles till it falls into the Indus close to Attock. It is joined about fifteen miles from Peshawur by the Swát river, which after draining the valley of that name, issues from the mountains near Abazái, below which its course is south-east for twenty-five miles to join the last. The Bára stream which is much smaller than either of these, rises in Teera, enters the valley ten miles to the south-west of Peshawur, and flows in an easterly direction to join the Cabul river above its junction with that of Swát. Much of its water, however, is absorbed in an early stage of its course, by various canals for the irrigation of the tracts on either side, one of the largest of these being for the supply of the city and cantonment of Peshawur. The Bodní is quite a small stream, which passes near Peshawur, to the northward, and joins a branch of the Cabul river.

Besides these, there are no permanent large streams, but in the Eusufzái country and other parts of the valley, there are many "nullas" where water flows for a longer or shorter time after rain, and in one or two cases for the greater part of the year; and in and near the beds of these, water is at most seasons found in wells from 12 to 30 feet deep. Indeed were it not for these, great part of the valley would be dependent for moisture on the scanty and precarious rain-fall, and much of it would be totally unfruitful. At many places, *e. g.* the Peshawur cantonment, and near Chumkunní to the south, water is not found within seventy feet of the surface (at the former with a temperature of 68° to 70° F. in July); and the well which the Sikhs were obliged to dig for the supply of their fort of Futtehghurh, Jumrood, (commanding the exit of the Khaiber,) is said to be no less than 180 feet in depth.

In the ordinary shallow wells, the Persian wheel is almost universal for irrigation purposes, propelled by a pair of bullocks or a buffalo, one advantage of the latter being that he will go on indefinitely

without a driver, when each of his eyes is covered by a conical leathern blinker.

In the valley generally the soil is a strong retentive clay, which is strikingly fertile wherever there is a full supply of water. There are in some places sandy tracts, but the extent of these is limited, and almost the only absolutely unfertile parts are those situated near the circumference of the valley, towards which, nearly every where so far as I have examined, (and the circumstance has been noted by several previous observers,) there exists a wide talus of shingle. This, which slopes towards the middle of the valley, is often several miles in breadth and in many places (*e. g.* near Abazáí,) more than 40 feet thick, as seen at cuttings. These shingly tracts are unproductive, but not universally so, as in some places the shingle is covered over by deep layers of a bluish, marly soil, the existence of the former at such places being only discovered at sections natural or artificial. This shingle is in general composed of fragments, more or less rolled, of the harder rocks of the surrounding hills; being mostly of limestone, and hard carbonaceous slate, and more rarely a red clayey rock.

The north-eastern part of the valley is much broken up by spurs and outlying low hills from the mountain mass bounding it in that direction. The latter, at least that part which General Cotton's Expedition passed through, is, in many places, plentifully strewn with blocks and shingle of a syenitic porphyry, which is occasionally seen *in situ*, as at Mungaltáná on the flanks of Mahábun, and at Kubbul on the Indus. Even fragments of this rock, however, are very rare throughout the rest of the valley.

Many of the spurs along this, the north edge of the valley, are composed of a very hard, dark coloured slate similar to that of Attock, generally dipping strongly towards the north or west; on this side, also, micaceous schist frequently occurs, as in the ridge parallel to the Indus at Kubbul, and in the Takht-i-Báí spur in Eusofzáí; and a micaceous schistose earthy limestone, near Michní, Shubkuddur and Abazáí; in the lower ridges and isolated hills the rocks generally dip towards the north-west and north. Near Michní there is an outburst of trap, under micaceous and quartzose schists.

On the east and south side of the valley as at mount Mítú near Attock,—the ridges south of Nowshera—the range on which, (the pro-

posed sanatorium of) Cheráát is situated,—also on the hills traversed by the Kohát pass, I have never observed granitic rocks or micaceous schists. The greater part of these hills, in which the dip is, generally, westerly at a high angle, and the strike approaches north and south, appears to be composed of various limestones often much contorted, ranging from a dark-coloured very much indurated silicious variety, to a calcareous flagstone containing concretionary ferruginous nodules, which has been used for flooring and roofing purposes.

The spurs which extend furthest from the edge towards the centre of the valley, are:—one which terminates at Takht-i-Bái, near which it reaches a height of 700 or 800 feet above the plain, and which is mainly composed of micaceous, quartzose and calcareous earthy schists; and the Bárá spur, (not far from the western extremity of the valley,) which stretches from the southern edge of the Khaiber hills to near Fort Bárá, and the strata of which appear to dip towards the north-west at an angle of about  $45^{\circ}$ : this I was unable to visit, as it is in an “unsafe” country, and I think beyond our border. Towards the middle of the valley, rock-masses are but seldom found in situ. There is, however, a low rocky ridge parallel to the Cabul river opposite Nowshera which is composed of calcareous shale, and on which I have found worn pieces of limestone, with obscure fossil shells. Similar limestone fragments, with impressions of Brachiopods (?) are abundant in the shingle of the Jumrood plain (near which Griffith records fossil *Pterocles*\* as found in arenaceous limestone,) but I have nowhere found any fossil *in situ* in this district, although in a ridge near Campbellpore (16 miles from Attock, cis-Indus) there are extensive beds of limestone abounding in shells.

There are also at various parts of the valley, horizontal beds of varying extent, of soft recent sandstone and conglomerate, and in such situations (as well as in very numerous places trans-Indus, to the south of the Peshawur district,) I have frequently found specimens of two species of shells (apparently *Planorbis* and *Limnea*).

No *kunkur* occurs in the Peshawur valley, nor am I aware of its being found to the west of Jhelum (170 miles to the south-east).

Most of the lime used in Peshawur appears to be brought from the range to the south towards Shamshattú, and besides it, the only

\* *Sic.* Griffith. Journals of Travels, p. 428.—Ed.

valuable or curious mineral products of the district or its neighbourhood that I am acquainted with are :—iron, which is brought, roughly smelted, in considerable quantity from Bajour, where it is found in the form of iron-sand ; naphtha, (*mumid* or *gunduk ka tel*) which is procured between Kalabagh and Attock, and used as an application to sores ; asbestos, said to be brought from a locality near the Khaiber pass ; and mica (*sang-i-jaráhat*, or *sim-gil*) which is used in powder and mixed with plaster for giving a silvery appearance to cornices, &c.

A tradition exists among the inhabitants of the district, apparently originating in a desire to account for the elevated sites chosen for many of the numerous ancient cities, whose ruins are found in various parts, that the whole of the bed of the valley was at one time under water. It appears very doubtful, however, if any such body of water has existed since long anterior to the erection of these buildings ; although, that there has been at least partial submergence is evidenced by the fact that in several places, (*e. g.* close to the fort of Abazáí, and near Ashnagar,) the remains of numerous buildings are found covered by the usual clayey soil, and whose foundations are several feet below the present level of the ground. These have generally been brought to light by accidental excavations or abrasion by water and are often accompanied by fragments of reliefs, apparently of Indo-Bactrian origin. But little has hitherto been done to throw light on the various ruins and reliefs that have been discovered in the Peshawur district, and the proper examination of the materials already available, with a systematic search for others, would amply repay the labours of any one practised in such researches. It is gratifying to know that part of the local funds have recently been made available for investigations in this direction, under the direction of the Rev. I. Loewenthal of the American Mission, who is admirably qualified for the task, and to whom I am much indebted for aid as to various subjects referred to in this paper.

Considerable tracts of the lower parts of the valley contain much saline matter, which effloresces abundantly on the surface, and the presence of which induces a copious growth of *Salsolacæ* with other plants (such as *Tamarix dioica* and *Berthelotia lanceolata*) which flourish in saline soil.

The uncultivated parts of the Peshawur district, are barren in

the extreme, there being no such thing as *forest*, and it is only towards the base of the surrounding hills, where small streams frequently occur (whose waters are, however, rapidly dissipated by irrigation and evaporation) that any considerable amount of shrubby vegetation is seen. This consists mostly of *Acacia Modesta*, *Olea Europæa*, *Dodonæa Burmanniana* and *Reptonia buxifolia*, which continue abundant as one ascends the hills (here, as elsewhere, the fact being noticeable that the southern aspect of the heights is less verdant than the northern;) while on the dry and barren low ground, the most conspicuous shrubs are scattered plants of *Zizyphus Jujuba*, *Adhatoda vasica*, *Capparis Aphylla*, *Salvadora*, *Vitex Negundo* (in dampish spots,) and *Tecoma undulata*.

Under these circumstances, all timber too large to be supplied by the plants above noted, is afforded either by the cultivated trees of the valley such as the mulberry, and *sissoo*, or by the timber rafts brought down the Swât and Cabul rivers, which consist chiefly of déodâr, with perhaps other pines. The large fire-wood supply for the cantonment is furnished by the above named shrubs, and large quantities mostly of oak (*Quercus Ilex*) are brought from the Khaiber. From all I can learn, it appears not unlikely that, ere many years elapse, the supply of fire-wood for Peshawur at reasonable rates, will be difficult or impossible.

The climate of Peshawur may be shortly described as the extreme of that of the Panjâb generally; *i. e.* there are great annual variations of temperature, great daily variation, especially in the cold season, a very dry atmosphere throughout most of the year, and a very limited rain-fall; the last occurring, not at the period of the usual "rainy season" of India, but in winter. I am sorry that I have not at my command any very lengthened series of observations on the meteorology of the district, but I have made use of the best series procurable, *viz.* observations on the temperature, humidity of the atmosphere, rain-fall, and barometrical variations made with the instruments supplied by Government, and extending over most of 1859-60 and the whole of 1861. For these I am chiefly indebted to Dr. Hugh Clark, Bengal Artillery.

*Temperature.* The observations on temperature were made nine times daily during part of the above period, and four times daily, during the remainder, and may be considered reliable.



TABLE 1.

|                | Means of daily<br>Maxima. | Means of daily<br>Minima. | Means of these |
|----------------|---------------------------|---------------------------|----------------|
| January, ..... | 60.67                     | 37.25                     | 48.96          |
| February, .... | 66.76                     | 41.5                      | 54.13          |
| March, .....   | 73.88                     | 49.47                     | 61.67          |
| April, .....   | 87.96                     | 63.07                     | 75.51          |
| May, .....     | 101.11                    | 70.95                     | 86.03          |
| June, .....    | 105.92                    | 78.31                     | 92.11          |
| July, .....    | 103.95                    | 80.37                     | 92.16          |
| August, .....  | 99.9                      | 79.77                     | 89.83          |
| September, ... | 97.2                      | 72.65                     | 84.92          |
| October, ..... | 87.35                     | 55.28                     | 71.31          |
| November, .... | 76.67                     | 42.45                     | 59.56          |
| December, ...  | 66.7                      | 39.80                     | 53.25          |
| Ann. means,    | 85.67                     | 59.23                     | 72.45          |

It thus appears that the three coldest months at Peshawur are December, January and February, during which the average temperature is  $52.11^{\circ}$  F., the highest single observation being  $77^{\circ}$  F., in February, and the lowest  $32^{\circ}$  F. in January; the three hottest months are June, July, and August, the average temperature of which is  $91.36^{\circ}$  F., the highest single observation noted, being  $113.5^{\circ}$  F., in June, and the lowest  $70.5^{\circ}$  F.; the hottest single month being July, with an average temperature of  $92.16^{\circ}$  F., and the coldest, Ja-

nuary, averaging  $48.96^{\circ}$  F. The average temperature of the three spring months calculated for these three years is about  $80^{\circ}$  F., and that of the three months of autumn nearly the same.

As it may be interesting to compare the temperature of Peshawur with that of Sahárunpore and Umballa, the nearest places to the south east, with regard to which I possess authentic series of observations, I here give some results for these stations, from the data given by Royle and Edgeworth, with the corresponding Peshawur figures. These shew that although the summers are hotter, and the winters colder at Peshawur than at these two places, yet its mean temperature is rather lower, which corroborates a remark made by Hooker and Thomson in the introduction to the *Flora Indica*.

TABLE 2.

|                  | May, Sahárunpore. | May, June, July, Umballa. | ae, July, A1 Pesh. | ae, Feb. ipore. | ae, Jan., Feb. Umballa. |
|------------------|-------------------|---------------------------|--------------------|-----------------|-------------------------|
| Means of Maxima, | 102.              |                           | 103.25             | 71.7            | 64.71                   |
| Means of Minima, | 72.16             |                           | 79.48              | 42.5            | ?                       |
| Means of these,  | 87.08             | 86.81                     | 91.36              | 57.1            | 55.81                   |
|                  |                   |                           |                    |                 | 52.11                   |

|                        | April to Sept.<br>Saharunpore. | April to Sept.<br>Umballa. | April to Sept.<br>Peshawur. | Oct. to March.<br>Saharunpore. | Oct. to March.<br>Umballa. | Oct. to March.<br>Peshawur. |
|------------------------|--------------------------------|----------------------------|-----------------------------|--------------------------------|----------------------------|-----------------------------|
| Means of Maxima, ..... | 97.58                          | ?                          | 99.34                       | 79.75                          | ?                          | 72.                         |
| Means of Minima, ..... | 70.25                          | ?                          | 74.18                       | 46.25                          | ?                          | 44.29                       |
| Means of these, .....  | 83.91                          | 84.15                      | 86.76                       | 63.00                          | 62.07                      | 58.14                       |

|                         | July.<br>Saharunpore. | July.<br>Umballa. | July.<br>Peshawur. | January.<br>Saharunpore. | January.<br>Umballa. | January.<br>Peshawur. | Annual.<br>Saharunpore. | Annual.<br>Umballa. | Annual.<br>Peshawur. |
|-------------------------|-----------------------|-------------------|--------------------|--------------------------|----------------------|-----------------------|-------------------------|---------------------|----------------------|
| Means of<br>Maxima, ..  | 95.5                  | ?                 | 103.95             | 64.5                     | ?                    | 60.67                 | 88.66                   | ?                   | 85.67                |
| Means of<br>Minima, ... | 76.0                  | ?                 | 80.37              | 38.5                     | ?                    | 37.25                 | 58.25                   | ?                   | 59.23                |
| Means of<br>these, ...  | 85.75                 | 84.41             | 92.16              | 51.5                     | 53.03                | 48.96                 | 73.40                   | 72.85               | 72.45                |

Several circumstances combine with the much diminished rainfall of summer to increase the heat at that season; viz., the valley being walled in on all sides by hills, these being very bare of vegetation, so that they absorb heat freely during the day, which is as freely radiated in the night, and the generally clear summer nights which also favour radiation.

I am sorry that under the head of daily range of temperature, I can only give the following figures for three months of 1861. These however I can certify as reliable, the observations having been made by Dr. J. J. T. Lawrence, who has devoted much attention to the study of meteorology in various parts of the Punjab.

TABLE 3.

| 1861.           | Mean daily range of<br>temperature. | Extreme range of tem-<br>perature in each<br>month. |
|-----------------|-------------------------------------|-----------------------------------------------------|
| January, .....  | 24.8                                | 42.6                                                |
| February, ..... | 27.2                                | 39.4                                                |
| March, .....    | 25.6                                | 44.6                                                |

I have noted upwards of  $40^{\circ}$  F. of range in one day (March, 1857,) near Peshawur. For Umballa, in January, Edgeworth gives the diurnal mean variation as  $24^{\circ} 29$  F. and the extreme diurnal range as  $35^{\circ}$  F.

At Peshawur, spring commences early in February, when the willow begins to bud, and in March most of the trees are again in full leaf. After this the temperature rises rapidly, and the summer heat, especially in July, is most oppressive and sultry, though tempered in that month by frequent dust-storms, often followed by showers. Mirage is in the hot season, a not uncommon phenomenon, and I have repeatedly seen it simulate lakes, trees and houses, where in reality there only existed a parched, baked soil, with here and there a straggling bush, and a bit of mud wall, or a few stones.

In August, autumn fairly sets in, the leaves of the trees getting brown and beginning to fall; in that month most of the willows, &c. become bare; and during September, when the marsh at Peshawur is probably at ebb, many of the aquatic plants common in it (*Nelumbium*, *Typha*, *Sagittaria*, *Alisma*, and many *Cyperaceæ*) have fruited and dried up.

After September the temperature rapidly diminishes for three months, and slight earthquakes are occasionally felt up to April. Although I have never seen snow fall in the valley during a residence there of the greater part of five winters, yet I think that slight falls of snow on the plain, are authenticated on at least two different occasions within the last few years, when, however, it remained unmelted for only a very short time. In each winter there are generally repeated falls of snow on those hills surrounding the valley, which reach to more than 3000 feet above the sea; and on the higher hills towards the north-west (Tartarra, over the Khaiber Pass, within 25 miles of Peshawur, is 7000 feet) snow is frequently seen for many days together; while on the still loftier inner ranges visible, it lies for many weeks at various times from the middle of November till the middle of May.

*Barometer.*—The following table shews the average barometrical variations calculated from four daily observations for most of the months of 1859-60, and the whole of 1861.

TABLE 4.

|                      | Means of<br>Maxima. | Means of<br>Minima. | Means of<br>these. |
|----------------------|---------------------|---------------------|--------------------|
|                      | in.                 | in.                 | in.                |
| January, ... ..      | 28.926              | 28.704              | 28.815             |
| February, ... ..     | 28.811              | 28.696              | 28.768             |
| March, ... ..        | 28.806              | 28.655              | 28.730             |
| April, ... ..        | 28.726              | 28.552              | 28.639             |
| May, ... ..          | 28.554              | 28.442              | 28.498             |
| June, ... ..         | 28.491              | 28.312              | 28.401             |
| July, ... ..         | 28.377              | 28.310              | 28.343             |
| August, ... ..       | 28.525              | 28.389              | 28.457             |
| September, ... ..    | 28.599              | 28.523              | 28.561             |
| October, ... ..      | 28.757              | 28.635              | 28.696             |
| November, ... ..     | 28.858              | 28.770              | 28.814             |
| December, ... ..     | 28.889              | 28.836              | 28.862             |
| Annual Means, ... .. | 28.695              | 28.568              | 28.632             |

*Amount of Rain.* The rain-fall, calculated from observations for the period from November 1859, to October 1860, and the whole of 1861, is as follows.

TABLE 5.

|                      | 1861.   | Nov. 1859<br>to<br>Oct. 1860. | Mean of<br>these. |
|----------------------|---------|-------------------------------|-------------------|
|                      | inches. | inches.                       | inches.           |
| January, ... ..      | .795    | 3.                            | 1.897             |
| February, ... ..     | .155    | 3.5                           | 1.827             |
| March, ... ..        | .725    | 1.5                           | 1.112             |
| April, ... ..        | .480    | 0.                            | .240              |
| May, ... ..          | .185    | 4.5                           | 2.342             |
| June, ... ..         | 1.680   | 0.                            | .840              |
| July, ... ..         | 7.799   | 2.                            | 4.899             |
| August, ... ..       | .848    | 0.                            | 0.424             |
| September, ... ..    | .287    | 0.                            | .143              |
| October, ... ..      | .052    | 0.                            | .026              |
| November, ... ..     | 0.      | 1.5                           | .75               |
| December, ... ..     | 1.322   | 1.011                         | 1.166             |
| Total Annual, ... .. | 14.328  | 17.011                        | 15.669            |

The annual amount of rain of Saharunpore and Meerut averages about 30 inches.

*Humidity.* The following table gives the mean temperature for each of the months of 1861 (calculated from the means of the

maxima and minima) with the means of the (four) daily observations of the Wet-bulb Thermometer, and the Dewpoint computed from these by Glaisher's formula.

TABLE 6.

| 1861.         |     |     |     |     | Mean temperature of<br>air (from Means of<br>Max. and Minima.) | Means of four daily<br>observations of wet<br>bulb Thermometer. | Dew Point. |
|---------------|-----|-----|-----|-----|----------------------------------------------------------------|-----------------------------------------------------------------|------------|
|               |     |     |     |     | °                                                              | °                                                               | °          |
| January,      | ... | ... | ... | ... | 49.05 F.                                                       | 46.46 F.                                                        | 43.87 F.   |
| February,     | ... | ... | ... | ... | 55.2                                                           | 48.53                                                           | 41.20      |
| March,        | ... | ... | ... | ... | 61.05                                                          | 50.75                                                           | 42.51      |
| April,        | ... | ... | ... | ... | 76.6                                                           | 61.3                                                            | 50.59      |
| May,          | ... | ... | ... | ... | 88.                                                            | 69.35                                                           | 58.16      |
| June,         | ... | ... | ... | ... | 92.55                                                          | 70.55                                                           | 57.35      |
| July,         | ... | ... | ... | ... | 87.95                                                          | 79.15                                                           | 73.87      |
| August,       | ... | ... | ... | ... | 87.05                                                          | 79.4                                                            | 74.81      |
| September,    | ... | ... | ... | ... | 82.1                                                           | 73.27                                                           | 67.98      |
| October,      | ... | ... | ... | ... | 68.45                                                          | 57.85                                                           | 50.43      |
| November,     | ... | ... | ... | ... | 58.                                                            | 46.42                                                           | 36.        |
| December,     | ... | ... | ... | ... | 52.25                                                          | 47.17                                                           | 42.09      |
| Annual Means, | ... | ... | ... | ... | 71.52                                                          | 60.85                                                           | 53.39      |

This at once shews the remarkable deficiency of atmospheric moisture at Peshawur during the year (and that in a season with more than the average amount of rain,) especially in the months of April, May, and June.

*Wind.* Four daily observations of the direction of the wind were made during 1861, but not regularly; however I assume that the irregularities were so irregular as in great measure to counterbalance each other, and the results are as follows.

It appears that throughout 1861, northerly and easterly winds were to southerly and westerly nearly as 9 to 5½, but from October to March southerly and westerly winds prevailed; and judging, from partial observations, which, however, ranged over the year, the night-breeze was generally from the southerly and westerly directions.

I shall now proceed to discuss the more immediate subject of the present paper, viz. the vegetation of the Peshawur valley, beginning with a survey of the cultivated plants.

It being well known that cold accompanied by moisture is much more apt to impede and destroy the vital functions of plants, than is dry cold, it can readily be conceived how the low temperature at Peshawur during the three coldest months, (averaging only 52° 11 F. and occasionally sinking below the freezing point) coupled with the 4.890 inches of rain that then fall, must effectually prevent the growth and culture of many trees, &c., that are found to thrive in the North-West Provinces, and render ineffectual the efforts to ripen fruit by others that are rather more hardy. Thus at Peshawur we look in vain for *Cratæva religiosa* (which grows at Jhelum, 170 miles to south east,) *Bombax*, *Grewia Asiatica*, *Aegle*, *Bergera*, *Feronia*, *Shorea*, *Sapindus*, *Cedrela*, *Acacia Arabica* (common in the lower Punjab,) *Tamarindus*, *Erythrina*, *Terminalia*, *Psidium*, *Nauclea*, *Morinda*, *Bassia*, *Mimusops*, *Millingtonia hortensis*, *Cordia* (which grows freely as far up as Lahore, 270 miles to the south-east,) *Gmelina*, *Embllica officinalis*, *Iatropa*, *Artocarpus*, *Bambusa*, (which has been repeatedly tried at Peshawur, and grows but does not thrive at Jhelum,) and others which are commonly cultivated (many also occurring wild) in the N. W. Provinces: and if, of some of these rare specimens occur in gardens at Peshawur, they are reared and preserved with difficulty; it is hopeless to search for such plants as the following; *Anona Nephelium*, *Eriobotrya*, *Carica Papaya*, *Santalum album*, *Piper Betel*, *Pandanus*, *Ananas*, *Caryota*, *Borassus*, *Cocos*, and the cultivated *Marantaceæ* and *Zingiberaceæ* which are only raised with difficulty in certain favourable situations in the N. W. Provinces.

Even *Opuntia* and *Agave* I have not seen in the valley, nor the various columnar and other *Euphorbiæ*; all of which are common as hedges, Cis-Sutlej.

Again, some tropical plants continue to exist at Peshawur, being favoured by exceptional circumstances of structure; *e. g.*, the plantain, whose vitals (so to speak) are protected by its closely sheathing leaves during the cold spring months, and which thrives tolerably as far as foliage is concerned, though its fruit is never matured.

The mango (which Timúr Shah is said to have made an unsuccessful attempt to introduce at Peshawur) barely lives, and in favourable seasons and situations ripens a little fruit, and there are a few trees of *Syzygium Jambolanum*, but most of them never produce mature fruit.

As is generally the case near other cities, Trans-Indus, and as far up as Jellalabad, there are about Peshawur a good many trees of *Phoenix dactylifera*, but the fruit, though carefully protected from the birds by nets, is I believe never good. The abundance of dates which are consumed by the inhabitants are mostly imported from the west.

The *Azadirachta Indica* (*nim*) does not grow here, (it reaches Lahore) but its congener *Melia Azedarach* (*bakáin* Hindí, *drek* Punjábí) is easily raised and common.

*Dalbergia Sissoo* is commonly planted, and grows to a great size, and of it there are occasionally magnificent old trees in villages, and at tombs, &c. ; one of these near Akora, being called, I believe, "Gilbert's tree," from an erroneous tradition that under it the "flying General" received the submission of the Sikhs! or Affghans! whom he had here caught up after the battle of Goojráť.

Besides these the ordinary trees planted by groves and by waysides, &c. are *Acacia Lebbek*, *Morus laevigata*, *Tamarix Gallica* (on the lower saline parts in large groves by villages,) and *Zizyphus Jujuba*. *Salix Babylonica* (?) is abundant by water-courses, &c., although Royle suggests that Elphinstone's "trees like willows" of the western Punjáb, are *Salvadora*.

*Moringa pterygosperma*, *Populus alba*, *Cassia fistula* and *Bauhinia variegata* are much less frequent than the above; *Sesbania Egyptiaca* is common as hedges, and *Parkinsonia* grows well; *Ficus religiosa* and *F. Indica* are occasional in villages, and *Salix Egyptiaca* is cultivated to some extent for the fragrant *bed mushk* distilled from its flowers, which is a favourite ingredient in the sherbets of the natives and supposed to be possessed of great virtues. *Cupressus sempervivens* flourishes in gardens as does *Populus fastigiata*, the latter called by the natives *Kashmiri sufedar*, so that it may have been introduced from Kashmir, where it abounds; very stunted specimens of *Platanus orientalis* and of *Juglans regia* occur in one or two gardens.

Peshawur was, by its early European visitors (from Elphinstone up to our conquest of the Punjáb) much lauded for its fruits, but perhaps unduly so, as almost the only kinds now cared for by Europeans are grapes and peaches, both of which are in their season (June, July) plentiful and excellent. Besides these, Quinces, Pomegranates, Plums, Figs, and various members of the orange family thrive well, and it is very pleasant, in spring, to ride round the extensive "peach gardens"

near cantonment, when the trees are in full blossom, and their scent is so powerful as to be *almost* oppressive. Indeed, at that season, Peshawur, with its widespread and blooming orchards, its abundant verdure, fine climate, and view of the snowy hills towering in masses to the north and north-west, is by no means the least pleasant station in India, so far as physical circumstances are concerned.

In one or two gardens there are some small trees of a *Diospyros* (*D. Lotus*?) which is common in the hills to the west of Kashmir, and both wild and in gardens, in Affghanistan. Its fruit *amluk*, is much esteemed by Affghans, (although I presume most Europeans would agree with Griffith that as a fruit it is "not worthy of any notice") and is procurable in abundance in the bazars, whither it is brought from Swát, &c. but it does not thrive well in the plains.

In gardens, the ordinary vegetables of the N. W. Provinces succeed, as do most of those of Europe that have been introduced into other parts of the plains of India. Potatoes have in some years thriven, but only exceptionally.

The field cultivation is much the same as that of the North West Provinces, and may be noted as follows.

1st. In the cold weather, when the climate and crops (*rubbee*) are much more nearly European than at other seasons, the grain-crops consist of wheat and barley which are sown in October, November and December, (advantage being generally taken of previous showers,) and harvested about May. The young crop is in spring frequently cut and given as fodder to horses, under the name of *Kasil*. The rains of the cold season render irrigation unnecessary for these, as for *Lawsonia* and *Sinapis*; while most of the following, also sown about the same time, have more or less irrigation; *Trigonella* *Fœnum Græcum*, *Ervum Lens*, *Vicia Faba*, *Beta Bengalensis*, *Coriandrum sativum*, *Anethum sowa*, Carrot, Radish, and Turnip. Several of these are only grown in gardens.

2nd. Field and garden crops (*Khurreef*) of the hot and rainy seasons, mostly sown in March and April (with one or two exceptions, such as Maize and Sorghum which are sown considerably later,) and ripening from July, (*Cucurbitaceæ*) to November, (Sorghum). The crops of this season are the following. Rice, of which several varieties are grown; by far the most esteemed of which is that of *Bará*, produced only at two or three villages near the *Bará* stream, not



far from the fort of that name, and some of which *e. g.* the produce of Shekan village, is said to sell as high as  $2\frac{1}{2}$  to  $1\frac{1}{2}$  seers a rupee; Maize; *Sorghum Vulgare*; *Setaria Italica*; *Penicillaria spicata*; *Panicum miliaceum*; *Phaseolus aconitifolius*, *Paureus*, and *P. radiatus*; *Dolichos*, *Cajanus flavus*, *Cicer arietinum*; *Portulaca*; *Solanum melongena*; *Sesamum orientale*; onion; six species of *Cucurbitaceæ*; *Colocasia antiquorum*; sugar, cotton, indigo, and tobacco. Of these only Maize, *Setaria*, *Phaseolus aconitifolius*, *Cicer arietinum* and *Sesamum* are not regularly irrigated.

As regards irrigation generally, it may be stated that where the land is wholly, or nearly, dependent on rain for moisture, only one crop a year is obtained; a large proportion of the land, especially of course that near the Cabul, Swát and Bárá rivers, yields two crops; while some patches near the city of Peshawur are said, with management, to give three crops a year.

But little Indigo and Lawsonia are grown, and only a small quantity of Flax is cultivated for its oil-seed; Sesamum, for a similar purpose, is not common, almost all the "sweet" oil used, being imported from below. Elphinstone erroneously supposes most of the oil used to be obtained from the Castor-oil plant (*budanjeer*) which, however, nowhere in the valley grows in sufficient quantity to furnish a tithe of the oil consumed. Sinapis is largely cultivated for its bitter (*Karwá*) oil.

There is no cultivation of *Carthamus*, nor I think of *Eleusine* or *Paspalum*, and the Poppy is very uncommon. There is no *Crotalaria juncea*, and *Hibiscus cannabinus* is but rarely grown along the edges of fields for its fibre. *Ricinus* and *Cannabis* are never cultivated, though both are common in waste ground.

In low rich ground near villages, &c., where water is plentiful and manure easily got, a good deal of sugarcane is grown, though producing only a very small proportion of the sugar consumed in the valley. A great deal of Cotton is raised, being sown about April and picked in September. Tobacco is a common crop, and immense quantities of the dried leaf are also imported from Affghánistán, the Kándahári being reckoned the best.

It is interesting to observe that among the Pushtú speaking inhabitants of the valley, the names of most of the common crops are the same as in Hindustání. A few, however, are apparently derived from

the Persian, *ghanum*, wheat, *kanzhale*, Sesamum, and *wasma*, Indigo, while some others that differ much or entirely from Hindustání are *urbushe* barley (connected by Mr. Loewenthal with the words *οροβος* and *erbs* in Greek and German,) *karízah* or *nakrízah*, *Lawsonia*; *malkhozí*, *Trigonella*; *típar*, turnip; *shole*, rice; *ghokht*, *Setaria Italica*; *kalol*, *Panicum Miliaceum* (?); *mai*, *Phaseolus Mungo*; *wurkharee*, *Portulaca*; *aozhah*, garlic; and *khatakæ*, melon.

The only crop manured on the large scale is sugarcane and occasionally Maize, and cultivation and irrigation are carried on much in the same way as in the N. W. Provinces, except that where the latter is performed by wells, the water is almost universally raised by means of the Persian wheel (*arhat*) instead of the leathern bag, (*charsa*). The water for irrigation is often brought from great distances in canals, and some of these must have cost immense labour. The more important of these are traditionally ascribed to "Akbar-badshah," but the traditions of the valley on this and other points are perhaps not always quite trustworthy.

Horses are not extensively reared in the valley, the great supply being obtained from the westward, whence come many *kafilas* each cold season. Wheel carriages are quite unknown among the inhabitants of the country parts of the valley, and all internal traffic in merchandise, grain, &c. is conducted by means of pack-bullocks, many of which are of a fine strong breed, very much superior to the ordinary kind generally used in ploughing, &c. here as elsewhere in India. Very large flocks of sheep and goats are reared, and the extensive thorny enclosures, formed (generally of dry *Zizyphus* bushes) for their protection from the night attacks of wild animals may be seen studded over even the driest parts of the plain at certain seasons.

Among the more uncommon or characteristic fauna of the Peshawur district may be mentioned the following. The *Márhkor* (*Capra megaceros*) is frequent in the hills to the north-east and said to be found in the Khattak range. The *Oortál* or *Kohidoomba* (*Ovis Vignei*) is found in the hills to the east of the valley, (and is common in some of the low hills near Hussan Abdál, and southward toward the Salt Range.) Porcupines, in Pushtú *Shkúnur* (*Hystrix cristata*?) occur in various parts of the district; I have found quills at 4,700 feet above the sea (at Cheraát) but it appears very doubtful if the animal lives in such places. A Pangolin (*Kishaur*,) is by no means

uncommon in various localities, attaining a length of 4 feet and upwards; its scales are much valued as a medicine by some classes of Hindoos. The "grave digger" *gorkakh*, *gorkash* (*bijú* Hindi) is occasional. A fresh-water tortoise, *shamshata*, inhabits the rivers, and attains a length of upwards of two feet. In the drier and more sandy parts, the soil is burrowed by thousands of a kind of lizard, *charmukhkæ* or *charmushkæ*, about a foot long, and I have repeatedly found live specimens of an allied, but amphibious animal, of considerably larger size, in water contained in hollows, on the hills around the valley.

A characteristic bird is the *obára* (*otis*) which is common in the drier, uncultivated parts and is interesting to the sportsman as it affords good hawking; as well as to the gastronome from a different point of view.

Several species of serpents occur in the district, but almost all—of scores—that I have examined, had no poison-fang, and I have never actually *known* of a case of death from a serpent bite near Peshawur.

In entering upon a detailed view of the Flora of Peshawur, I shall first give a list of all the plants I collected in the district with their periods of flowering, so far as this was noted by me, their frequency, and the native names of the more important species. Almost all the identifications are those of Dr. T. Thomson, my obligations to whom in this and other respects, it is impossible for me to overrate.

Some remarks are added as to the geographical distribution of the Peshawur plants, followed by a few observations on the more noteworthy species.

In this list, the plant is understood to grow in the *plain* of Peshawur, *i. e.* about 1000 to 1500 feet above the sea, unless where a height is added, and all the native names are those in use by the Pushtu speaking inhabitants unless when otherwise stated. I have been careful to exclude all Pushtu names that I do not know to be in use in the Peshawur district.

## List of plants collected in and near the Peshawur valley.

| Name of plant.                                     | Frequency.                                   | Period of flower or fruit.     | Pushitu name.     |
|----------------------------------------------------|----------------------------------------------|--------------------------------|-------------------|
| <i>Ranunculus aquatilis</i> , L.                   | Abundant.                                    | January, February fl.          |                   |
| <i>R. sceleratus</i> , L.                          | Ditto.                                       | Oct. Feb. a few up to July fl. |                   |
| <i>R. muricatus</i> , L.                           | Ditto.                                       | Feb. fl.                       |                   |
| <i>R. arvensis</i> , L.                            | Ditto.                                       | Feb. March fl.                 |                   |
| <i>R. lævis</i> ?                                  | Very rare and only found in leaf.            |                                |                   |
| <i>Adonis autumnalis</i> , L.?                     | Abundant.                                    | March, April fl.               |                   |
| <i>Ceratocephalus falcatius Mærch.</i>             | A few plants at one place only.              | April fl.                      |                   |
| <i>Clematis orientalis</i> , L.?                   | Above 4,000 feet.                            |                                |                   |
| <i>Cocculus Lœbea, Forsk.</i>                      | Abundant on dry precipitous banks.           | Oct. Nov. fl. and fr.          | <i>Parantti.</i>  |
| <i>Nelumbium speciosum.</i>                        | Common in some marshes, probably introduced. |                                |                   |
| <i>Papaver cornigerum, Stocks.</i>                 | Rare.                                        | Beginning of July fl.          |                   |
| <i>P. dubium</i> var <i>β</i> <i>lævigatum.</i>    | Common.                                      | April fl.                      | <i>Lalagül.</i>   |
| <i>Fumaria officinalis</i> var. <i>parviflora.</i> | Profuse.                                     | March fl.                      |                   |
| <i>Hyoscyamum procumbens</i> , L.                  | Abundant.                                    | Feb. March fl.                 |                   |
| <i>Capsella Brusa Pastoris</i> , L.                | Ditto.                                       | March, April fl.               |                   |
| <i>Sisymbrium Irio, DC.</i>                        | Ditto.                                       | Feb. March fl.                 |                   |
| <i>Lepidium Draba</i> , L.                         | Ditto.                                       | Ditto, ditto.                  |                   |
| <i>Lepidium ruderale</i> , L.?                     | Common.                                      | Feb. fl.                       |                   |
| <i>Malcolmia Africana</i> , R. Br.                 | Abundant.                                    | Feb. March fl.                 |                   |
| <i>Goldbachia lævigata, DC.</i>                    | Ditto.                                       | March fl.                      |                   |
| <i>Leptaleum filifolium, DC.</i>                   | Common.                                      | March, April fl.               |                   |
| <i>Malcolmia</i> , sp.                             | Profuse.                                     | March fl.                      |                   |
| <i>Notoceras</i> , sp.                             | Abundant.                                    | Ditto.                         | <i>Páchagül.</i>  |
| <i>Euclidium Syriacum, DC.</i>                     | Ditto.                                       | March, April fl.               | <i>Shávanülá.</i> |
| <i>Alyssum Calycinum</i> , L.?                     | Common.                                      | Feb. March fl.                 |                   |
| <i>Sisymbrium Sophia</i> , L.                      | Ditto.                                       | March, April fl.               |                   |
|                                                    |                                              | Ditto, ditto.                  |                   |

| Name of Plant.                     | Frequency.                       | Period of flower or fruit. | Pushtu name. |
|------------------------------------|----------------------------------|----------------------------|--------------|
| <i>Nasturtium</i> , sp. ?          | Not common.                      |                            |              |
| <i>Arabis arenosa</i> ?            | Rare.                            | March fl.                  |              |
| <i>Neslia paniculata</i> , Desv.   | Ditto.                           | Ditto.                     |              |
| <i>Chorispora</i> , sp.            | Ditto.                           | Ditto.                     |              |
| <i>Crucifera</i> .                 | Rare.                            | April fl.                  |              |
| <i>Oligomeris glaucescens</i> .    | Not common.                      | March fl.                  |              |
| <i>Polanisia tocsandra</i> .       | Abundant.                        | Most of year fl.           |              |
| <i>Capparis spinosa</i> , L.       | Common on dry precipitous banks. | July, Nov. fl.             |              |
| <i>Capparis aphylla</i> , W. A.    | Common.                          | Oct. Nov. fl. &c.          |              |
| <i>Cleome Ruta Jacq.</i>           | Rare.                            | July, Nov. fl.             | Kbarro.      |
| <i>C. droserifolia</i> .           | Ditto.                           | Sept. fl.                  | Kitta.       |
| <i>C. linearis</i> .               | Ditto.                           | Augt. Oct. fl.             |              |
| <i>Viola Patrinii</i> ?            | Very rare, in leaf.              |                            |              |
| <i>V. sp.</i>                      | Rare.                            | May fl. Nov. fr.           |              |
| <i>Polygala Vahlana</i> , DC.      | Ditto.                           | Augt. fl.                  |              |
| <i>Frankenia pulverulenta</i> , L. | Common in saline ground.         | Nov. Feb. fl.              |              |
| <i>Mollugo nudicaulis</i> , L.     | Common.                          | Augt. Oct. fl.             |              |
| <i>M. Cerviana</i> , Ser.          | Not common.                      | Ditto, ditto.              |              |
| <i>Stellaria media</i> , With.     | Abundant.                        | Feb. March. fl.            |              |
| <i>Arenaria serpyllifolia</i> , L. | Common.                          | Feb. fl.                   |              |
| <i>Silene conoidea</i> , L.        | Ditto.                           | Feb. March fl.             |              |
| <i>S. sp.</i>                      | Ditto.                           | March fl.                  |              |
| <i>S. Leysseroides</i> , Boiss.    | Abundant.                        | June fl.                   |              |
| <i>Dianthus</i> , sp.              | Not uncommon.                    |                            |              |
| <i>D. sp.</i>                      | Not common.                      |                            |              |
| <i>Caryophyllaceæ</i> ?            | Rare.                            |                            |              |
| <i>Do. ?</i>                       | Not common.                      |                            |              |
| <i>Bergia ammannioides</i> .       | Common where damp.               | Nov. March fl.             |              |
| <i>B. estivosa</i> , W. and A.     | Rare.                            | July, Nov. fl.             |              |
| <i>Linum trigynum</i> , Rozb.      | At 3,000 feet.                   |                            |              |

|                                                   |                                   |                            |                                          |
|---------------------------------------------------|-----------------------------------|----------------------------|------------------------------------------|
| <i>L. strictum</i> .                              | Very rare.                        | Most of year fl. or fruit. |                                          |
| <i>Oreophora tinctoria</i> , Juss.                | Abundant.                         | June, Nov. fl.             |                                          |
| <i>Euphorbia thymifolia</i> , Roxb.               | Ditto.                            | April, Oct. fl.            |                                          |
| <i>E. hypericifolia</i> , L.                      | Ditto.                            | Oct. fl.                   |                                          |
| <i>E. dracunculoides</i> , Lam.?                  | Very rare.                        | Feb. March fl.             | <i>Ganda bûte</i> .                      |
| <i>E. Helioscopia</i> , L.                        | Abundant.                         |                            |                                          |
| <i>E. Peplus</i> ?                                | Rare.                             |                            |                                          |
| <i>Flieggea virosa</i> .                          | Very rare.                        | Oct. fl.                   |                                          |
| <i>Ricinus communis</i> , L.                      | Common.                           | Oct. March fl. and fr.     |                                          |
| <i>Andrachne telephioides</i> , L.                | Common on dry mounds.             | Oct. June fl.              |                                          |
| <i>A. aspera</i> .                                | Not common.                       | July, Augt. fl.            |                                          |
| <i>Baliospermum</i> , sp.                         | Ditto.                            | Oct. fl.                   | <i>Torapâna</i> .                        |
| <i>Abutilon Indicum</i> , G. Don.                 | Rare.                             | Augt. Nov. fl.             |                                          |
| <i>Malva parviflora</i> , L.                      | Abundant.                         | Feb. March fl.             | <i>Panîrak</i> .                         |
| <i>Abelmoschus ficulneus</i> , W. and A.          | Common in fields.                 | July fl.                   |                                          |
| <i>Hibiscus hirtus</i> , L.                       | At 2,500 feet.                    |                            |                                          |
| H. sp.?                                           | Not uncommon, fields.             | July, Nov. fl.             |                                          |
| <i>Melhania abutiloides</i> , Wight.              | Rare.                             | Augt. fl. and fr.          |                                          |
| <i>Corchorus trilocularis</i> , L.                | Common.                           | Augt. Oct. fl. and fr.     |                                          |
| <i>C. olitorius</i> , L.                          | Abundant.                         | April, Oct. fl. and fr.    |                                          |
| <i>Grewia oppositifolia</i> , Ham.                | At 2000 to 3000 feet.             | Augt. Nov. fr.             | <i>Pastawane</i> .                       |
| <i>Grewia Rothii</i> , DC.                        | At 2000 to 2500 feet.             | Augt. fruit.               |                                          |
| <i>G. Betulaefolia</i> , Wall.                    | Not uncommon on low hills.        | Augt. Oct. fruit.          | <i>Khîrcha</i> .                         |
| <i>Dodonaea Burmanniana</i> , DC.                 | Not uncommon.                     | Feb. fl. (in cultivation). | <i>Ghurâske</i> ; <i>Sanatta</i> , Punj. |
| <i>Erodium martianum</i> , L. H.                  | Abundant.                         | March, April fl.           |                                          |
| <i>E. Cicutarrum</i> , L.                         | Ditto.                            | Feb. April fl.             |                                          |
| E. sp.?                                           | Rare.                             | March fl.                  |                                          |
| <i>Oxalis corniculata</i> , L.                    | Abundant on edges of ditches, &c. | Oct. March fl.             | <i>Travûke</i> .                         |
| <i>Fegonia Cretica</i> , L.                       | Abundant.                         | Oct. March fl. and fr.     | <i>Aghzai</i> .                          |
| <i>Tribulus terrestris</i> , L.                   | Ditto.                            | March, Oct. fl. and fr.    | <i>Krânda</i> .                          |
| <i>Peganum Harmala</i> , L.                       | Profuse.                          | April, Oct. fl. and fr.    | <i>Spelane</i> .                         |
| <i>Haplophyllum</i> , sp.                         | Very rare.                        | June fl.                   |                                          |
| <i>Catha edulis</i> , Forsk or <i>Celastrus</i> ? | Common.                           | Augt. Oct. fl. and fr.     | <i>Suraghzai</i> ; <i>Patâk</i> , Punj.  |
| <i>Seserchia</i> , sp.                            | Ditto.                            | Augt. Nov. fl. and fr.?    | <i>Mundni</i> .                          |
| <i>S. oppositifolia</i> .                         | Not uncommon.                     |                            |                                          |

| Name of plant.                          | Frequency.                             | Period of flower or fruit.                       | Pushtu name.                                                         |
|-----------------------------------------|----------------------------------------|--------------------------------------------------|----------------------------------------------------------------------|
| <i>Zizyphus Jujube, Lam.</i>            | Profuse.                               | Oct. Nov. fl. and fr. large var.<br>small ditto. | <i>Berra.</i><br><i>Karkana.</i>                                     |
| <i>Z. vulgaris, Lam. ?</i>              | Very rare.                             | Oct. fl.                                         |                                                                      |
| <i>Rhamnus virgatus</i> (two species ?) | Occasional plain & com. to 2,500 feet. | Aug. Nov. fl. and fr.                            | <i>Wurakei Kākai.</i><br><i>Shne (Schnee).</i><br><i>Khep, Punj.</i> |
| <i>Khus (Kakra singhi) acuminata.</i>   | Very rare.                             |                                                  |                                                                      |
| <i>Crotalaria Burhia, Ham.</i>          | Common.                                | Oct. Nov. fl.                                    |                                                                      |
| <i>Crotalaria medicaginea, Lam.</i>     | Very rare.                             |                                                  |                                                                      |
| <i>Acacia Jaqueuemoni.</i>              | Not common.                            | Nov. fl.                                         | <i>Hanza.</i>                                                        |
| <i>A. Modesta, Wall.</i>                | Abundant.                              | April, May fl.                                   | <i>Palosa ; Phuldi, Punj.</i>                                        |
| <i>Dalbergia sissoo, Roxb.</i>          | Common by streams, &c.                 | Oct. fr.                                         | <i>Shewa ; Tāli, Punj.</i>                                           |
| <i>Taverniera, sp.</i>                  | Rare.                                  | Oct. fl.                                         | <i>Sassā.</i>                                                        |
| <i>Alysicarpus bupleurifolius, DC.</i>  | Very rare.                             | Oct. fr.                                         |                                                                      |
| <i>Vicia sativa, L.</i>                 | Common.                                | Feb. fl.                                         |                                                                      |
| <i>Melilotus parviflora, Desf.</i>      | Abundant.                              | Feb. March fl.                                   |                                                                      |
| <i>Medicago denticulata, Willd.</i>     | Ditto.                                 | Ditto, ditto.                                    |                                                                      |
| <i>Medicago maculata, Willd.</i>        | Ditto.                                 | Dec. March fl.                                   |                                                                      |
| <i>M. Lupulina, L.</i>                  | Not uncommon.                          | March fl.                                        | <i>Khkare.</i>                                                       |
| <i>Astragalus tribuloides, Del.</i>     | Common                                 | April fl.                                        | <i>Ogdā.</i>                                                         |
| <i>A. sp.</i>                           | Occasional.                            |                                                  |                                                                      |
| <i>A. sp. ?</i>                         | Not uncommon.                          | March, April fl.                                 |                                                                      |
| <i>Alhagi Maurorum, L.</i>              | Abundant.                              | June, Aug. fl.                                   | <i>Zoz. Zozān.</i>                                                   |
| <i>Trifolium repens, L.</i>             | Not uncommon.                          | April fl.                                        | <i>Shafal, shotal.</i>                                               |
| <i>Lotus angustissimus, L.</i>          | Occasional.                            | Ditto.                                           | <i>Ranj kakh.</i>                                                    |
| <i>Sesbania aculeata, Pers.</i>         | Abundant in fields.                    | July fl. Nov. fr.                                |                                                                      |
| <i>Prosopis Stephaniana, Spr.</i>       | Not uncommon, stunted.                 | Nov. fl.                                         | <i>Aghzakai ; jand, Punj.</i>                                        |
| <i>Edwardia mollis, Royle.</i>          | 3,000 feet.                            |                                                  | <i>Ghwareja.</i>                                                     |
| <i>Indigofera Gerardiana, Wall.</i>     | Ditto.                                 |                                                  | <i>Kaskai.</i>                                                       |
| <i>Rhynchosia minima, DC.</i>           | Not uncommon.                          | Aug. fl.                                         |                                                                      |
| <i>Lespedeza juncea, Pers.</i>          | At 3,500 feet.                         |                                                  |                                                                      |
| Leguminosae ?                           | Rare.                                  | June fl.                                         |                                                                      |

|                                          |                                   |                    |               |
|------------------------------------------|-----------------------------------|--------------------|---------------|
| Leguminosæ ?                             | Rare.                             | July fl.           | Karvérei.     |
| <i>Rubus fruticosus</i> , L.             | Not uncommon.                     | June, Oct. fl. fr. |               |
| <i>Potentilla supina</i> , L.            | Common.                           | Nov. Mar. fl.      |               |
| <i>Rubus lasiocarpus</i> .               | Only in leaf, once.               |                    |               |
| <i>Amygdalus Persica</i> .               | At 5,000 feet ?                   |                    |               |
| <i>Epilobium tomentosum</i> , Vent.      | Abundant at water.                | June, Nov. fl. fr. | Garghashtái.  |
| <i>Trapa Bispinosa</i> , Roxb.           | Occasional.                       | Oct. fl. and fr.   |               |
| <i>Ceratophyllum demersum</i> ?          | Profuse in water.                 |                    |               |
| <i>Annania auriculata</i> , Willd.       | Common.                           | July, Nov. fl.     |               |
| <i>A. vesicatoria</i> , Roxb.            | Abundant in irrigated fields, &c. | Nov. fr.           |               |
| <i>Grialea tomentosa</i> .               | Rare.                             |                    |               |
| <i>Tamarix orientalis</i> , Forsk.       | Common.                           | April fl.          | Khar, Ghua.   |
| <i>T. dioica</i> , Roxb.                 | Abundant by streams.              | July fl.           | Pilchi, Punj. |
| <i>Citrullus colocynthis</i> ?           | Rare.                             | April fruit.       |               |
| <i>Trianthema pentandra</i> , L.         | Occasional.                       | Augt. Nov. fl.     |               |
| <i>T. crystallina</i> .                  | Rare.                             | Augt. Oct. fl.     |               |
| <i>Portulaca-oleracea</i> , L.           | Common.                           | July, Oct. fl.     |               |
| <i>P. quadrifida</i> , L.                | Rare.                             | Augt. fl.          |               |
| <i>Spergularia rubra</i> , Pers.         | Common.                           | Feb. March fl.     |               |
| <i>S. media</i> , Pers.                  | Ditto.                            | Ditto, ditto.      |               |
| <i>Herniaria hirsuta</i> , L.            | Common.                           | March, April fl.   |               |
| <i>Tillæa muscosa</i> .                  | Not common.                       | March fl.          |               |
| <i>Crasulacæ</i> ?                       | Rare.                             | Ditto, ditto.      |               |
| <i>Orygia trianthemoides</i> , W. and A. | Occasional.                       | July fl. ?         |               |
| <i>Sium angustifolium</i> , L.           | Common, marshes.                  | June fl. ?         |               |
| <i>Eryngium dichotomum</i> , Desf.       | Not common.                       | April, July fl.    |               |
| <i>Pimpinella crinita</i> Boiss. ?       | Occasional.                       |                    |               |
| <i>Abnanthe stolonifera</i> , Roxb.      | Not uncommon.                     | July fl.           |               |
| <i>Umbelliferæ</i> ?                     | Occasional.                       |                    |               |
| <i>Galium aparine</i> , L.               | Abundant.                         | March fl.          |               |
| <i>G. tricoorne</i> ?                    | Occasional.                       | March, April fl.   |               |
| <i>Asperula cynanchica</i> , L. ?        | Rare.                             | Augt. fl.          |               |
| <i>Rubiaceæ</i> ?                        | Ditto.                            |                    |               |
| <i>Scabiosa Olivieri</i> .               | Common, on dry plains.            | March fl.          |               |
| <i>Artemisia elegans</i> , Roxb.         | Abundant.                         | July, Oct. fl.     | Lavange.      |



| Name of Plant.                          | Frequency.                     | Period of flower or fruit. | Pushtu Name.                             |
|-----------------------------------------|--------------------------------|----------------------------|------------------------------------------|
| <i>A. vestita</i> , Wall.               | Rare.                          | Sept. Nov. fl.             | <i>Tarkh</i> ?                           |
| <i>A. laciniata</i> , DC. ?             | Common.                        |                            |                                          |
| <i>A. Indica</i> ?                      | Rare.                          |                            |                                          |
| <i>Ecilipia erecta</i> , L.             | Abundant at water.             | Most of year, fl.          |                                          |
| <i>Sonchus arvensis</i> , L.            | Abundant.                      | Augt. Feb. fl.             |                                          |
| <i>S. oleraceus</i> , L.                | Common.                        | Feb. Sept. fl. ?           |                                          |
| <i>Phenopus vimineus</i> , DC.          | Abundant.                      | April, Oct. fl.            | <i>Shamukei</i> .                        |
| <i>Taraxacum officinale</i> , Wigg.     | Ditto.                         | Feb. fl.                   |                                          |
| <i>Matricaria discoloris</i> , DC.      | Ditto.                         | Feb. March fl.             |                                          |
| <i>M. Precox</i> , DC.                  | Ditto.                         | March, April fl.           |                                          |
| <i>Microthynchus nudicaulis</i> , Less. | Ditto.                         | Oct. March fl.             | <i>Suteigul</i> ; <i>Babuna</i> , Hindi. |
| <i>Gnaphalium multiceps</i> , Wall. ?   | Common.                        | March, Nov. fl.            | <i>Tartzhua Spudukei</i> .               |
| <i>Calendula officinalis</i> , L.       | Abundant.                      | March, April fl.           |                                          |
| <i>Lactuca auriculata</i> , Wall.       | Common.                        | Ditto, ditto, ditto.       | <i>Zergul</i> .                          |
| <i>Koelpinia linearis</i> , Pell.       | Common.                        | Ditto, ditto, ditto.       |                                          |
| <i>Cirsium arvense</i> , L.             | Abundant in fields.            | March, Oct. fl.            | <i>Aghzai, Azghai</i> .                  |
| <i>Silybum Marianum</i> , DC.           | Not uncommon.                  | April, March fl.           |                                          |
| <i>Centaurea Calcitrapa</i> , L.        | Abundant.                      | April, June fl.            |                                          |
| <i>Scorzonera</i> n. sp. ?              | Common.                        | April fl.                  | <i>Wrizi</i> .                           |
| <i>S. sp.</i> ?                         | Occasional.                    | March fl.                  |                                          |
| <i>Carthamus oxyacantha</i> , Bieb.     | Abundant.                      | April, June fl.            | <i>Kharezah</i> .                        |
| <i>Cichorium Intybus</i> , L.           | Occasional.                    | April, July fl.            |                                          |
| <i>Blumea lacera</i> , DC. ?            | Not uncommon.                  | March, April fl. ?         |                                          |
| <i>Filego Germanica</i> , L.            | Common.                        | Ditto, ditto, fl.          |                                          |
| <i>Xanthium Strumarium</i> , L.         | Rare.                          | July Augt. fl.             | <i>Bagaidri</i> , Punj.                  |
| <i>Berthelobia lanceolata</i> , DC.     | Abundant where saline and dry. | Nov. fl.                   | <i>Sármei</i> .                          |
| <i>Francoeuria crispae</i> .            | Occasional.                    | Nov. March fl.             | <i>Sutei</i> .                           |
| <i>Adenostemma</i> sp.                  | Not uncommon at water.         | July, Nov. fl.             |                                          |
| <i>Inula graveolens</i> .               | Abundant.                      | Sept. Oct. fl.             |                                          |
| <i>I. Eupatorioides</i> , DC.           | At 3,500 feet.                 |                            |                                          |

|                                                           |                                            |                    |                            |
|-----------------------------------------------------------|--------------------------------------------|--------------------|----------------------------|
| <i>Pulicaria vulgaris</i> ?                               | Occasional.                                | Nov. fl.           | Lakhtei ; Poli, Punj.      |
| <i>Cousinia calceitrapaeformis</i> , DC.                  | Not uncommon.                              | April, May fl.     |                            |
| <i>C. sp.</i> ?                                           | Rare.                                      | March fl.          |                            |
| <i>Trichogyne caniflora</i> .                             | Common.                                    | Ditto, ditto.      |                            |
| <i>Apotaxis candicans</i> .                               | Occasional.                                | March, April fl.   | Kálíśíś, Punj.             |
| <i>Bidens cernua</i> , L.                                 | Rare.                                      | Oct. Nov. fruit.   | Túrpana.                   |
| <i>Phagnalon denticulatum</i> .                           | Ditto.                                     | Nov. fruit.        |                            |
| <i>Matricaria</i> , sp. ?                                 | Occasional.                                | March fl.          |                            |
| <i>Barthausia</i> , sp. ?                                 | Not common.                                | Ditto, ditto.      |                            |
| <i>Echinops</i> , sp. ?                                   | Rare.                                      | March fl.          |                            |
| <i>Senecio</i> , sp. ?                                    | Occasional.                                | June fl.           |                            |
| <i>Microdonchus</i> , sp. ?                               | Ditto.                                     |                    |                            |
| <i>Erigeron</i> , sp. ?                                   | Rare.                                      | March, July fl.    |                            |
| <i>Utricularia</i> , sp. ?                                | Occasional.                                | March, Nov. fl.    |                            |
| <i>Samolus Valerandi</i> , L.                             | Common.                                    | Feb. fl.           |                            |
| <i>Anagallis arvensis</i> $\beta$ <i>Oerulea</i> .        | Common at foot of hills and to 3,000 feet. | Nov. fruit.        |                            |
| <i>Reptonia buxifolia</i> , A. DC.                        | 3,000 feet.                                | Nov. fr.           | Gárgára.                   |
| <i>Myrsine Africana</i> , L.                              | Plain to 4,500 feet.                       | Augt. Nov. fruit ? | Shanshid ; Behrang, Hindi. |
| <i>Olea Europea</i> , L.                                  | 3,000 feet.                                |                    | Khwan ; Káu, Punj.         |
| <i>Jasminum revolutum</i> Sims $\beta$ <i>pubigerum</i> . | Common by streams.                         | May, Nov. fl. ?    | Náugei.                    |
| <i>Nerium odorum</i> , L.                                 | Abundant.                                  | Feb. March fl.     | Gantra ; Kaner, Hindi.     |
| <i>Rhazya stricta</i> , DC.                               | Rare.                                      |                    | Gandere ; Vena, Punj.      |
| <i>Orthanthera viminea</i> , Wright.                      | Abundant.                                  | March, Nov. fl.    | Mova ?                     |
| <i>Calotropis procera</i> , R. Br.                        | Rare.                                      |                    | Sputnei.                   |
| <i>Pergularia pallida</i> .                               | Abundant at foot of hills.                 | April fl.          | Barrarra.                  |
| <i>Periploca aphylla</i> , Dne.                           | Rare.                                      | Augt. fl.          | Ambarvel, Punj.            |
| <i>Pentstemon microphylla</i> .                           | At 1500 to 2000 feet.                      | April fl.          |                            |
| <i>Damia extensa</i> , R. Br.                             | Occasional.                                | Augt. fl. ?        | { Pamanne, pavane ; cháuñ, |
| <i>Boucerosia</i> , sp.                                   | Rare.                                      | June, Nov. fl.     | { Punj. panjangasht Per.   |
| <i>Xystelma esculenta</i> ?                               | Ditto.                                     |                    |                            |
| <i>Uddleia asiatica</i> , L.                              | Common.                                    |                    |                            |
| <i>rythraea Centaurium</i> , Pers.                        | Occasional.                                |                    |                            |
| . sp.                                                     |                                            |                    |                            |

| Name of Plant.                                  | Frequency.                                  | Period of flower or fruit. | Pushtu name.                                            |
|-------------------------------------------------|---------------------------------------------|----------------------------|---------------------------------------------------------|
| <i>Limnathemum cristatum</i> , <i>Gris.</i>     | Common in marshes.                          | Nov. April fl.             | { <i>Rebdoon, regdāwan; Rohāra,</i><br><i>Punj.</i>     |
| <i>Tecoma undulata</i> , <i>Don.</i>            | Common stunted.                             | April fl.                  |                                                         |
| <i>Convolvulus pluricaulis</i> , <i>Chois.</i>  | Not uncommon.                               | Oct. fl.                   | { <i>Zarbutei banansha; Nāla-</i><br><i>tāri, Punj.</i> |
| <i>Convolvulus arvensis</i> , <i>L.</i>         | Abundant in fields.                         | March, Augt. fl.           |                                                         |
| <i>Ipomoea sessiliflora</i> , <i>Retz.</i>      | Not uncommon.                               | Sept. Oct. fl.             | { <i>Paighambari phūl,</i>                              |
| <i>Pharbitis nil</i> , <i>Chois.</i>            | Rare.                                       | Augt. fl. ?                |                                                         |
| <i>Evolvulus alsinoides</i> , <i>L.</i>         | Occasional.                                 |                            | { <i>Shūshk.</i>                                        |
| <i>Cuscuta reflexa</i> , <i>Roeb.</i>           | Common.                                     | Feb. fl.                   |                                                         |
| <i>Heliotropium ramosissimum</i> , <i>Sieb.</i> | Abundant.                                   | Oct. &c. fl.               | { <i>Khabarra; Shumshād, sag-</i><br><i>gar, Punj.</i>  |
| <i>H. brevifolium</i> , <i>Walt.</i>            | Common.                                     | Augt. Oct. fl.             |                                                         |
| <i>H. Europeum</i> , <i>L.</i>                  | Abundant.                                   | July, Nov. fl.             | { <i>Kwansafsaiei.</i><br><i>Warūmba, maraghāne.</i>    |
| <i>Trichodesma Indicum</i> , <i>R. Br.</i>      | Common.                                     | Augt. Nov. fl.             |                                                         |
| <i>Noucea</i> , <i>sp.</i>                      | Occasional.                                 | March fl.                  | { <i>Kātāld.</i>                                        |
| <i>N. Edgeworthii</i> , <i>DC.</i>              | Common.                                     | Ditto ditto.               |                                                         |
| <i>Arnebia echinoides</i> , <i>A. DC.</i>       | Common.                                     | March, April fl.           | { <i>Khabarra; Shumshād, sag-</i><br><i>gar, Punj.</i>  |
| <i>Rochelia stellulata</i> , <i>Retz.</i>       | Ditto.                                      | April fl.                  |                                                         |
| <i>Lycopsis arvensis</i> , <i>L.</i>            | Not uncommon.                               | June, July fl.             | { <i>Kwansafsaiei.</i><br><i>Warūmba, maraghāne.</i>    |
| <i>Cynoglossum micrantha</i> ?                  | Occasional.                                 | Oct. fl.                   |                                                         |
| <i>C. sp.</i>                                   | Ditto.                                      | Oct. Nov. fl.              | { <i>Kātāld.</i>                                        |
| <i>Lithospermum arvense</i> , <i>L.</i>         | Abundant in fields.                         | March, June fl.            |                                                         |
| <i>Anchusa</i> , <i>sp. ?</i>                   | Not uncommon.                               | March, April fl.           | { <i>Khabarra; Shumshād, sag-</i><br><i>gar, Punj.</i>  |
| <i>Ehretia aspera</i> , <i>Roeb.</i>            | Occasional on cliffs; common at 2,500 feet. | Augt. Nov. fl. and fr.     |                                                         |
| <i>Solanum nigrum</i> , <i>L.</i>               | Common.                                     | Nov. fl. and fr.           | { <i>Kwansafsaiei.</i><br><i>Warūmba, maraghāne.</i>    |
| <i>S. Jacquini</i> , <i>Willd.</i>              | Occasional.                                 | Augt. Oct. fl.             |                                                         |
| <i>Withania somniferum</i> , <i>Dun.</i>        | Common.                                     | Nov. June fl.              |                                                         |

|                                                    |                      |                        |                                                                    |
|----------------------------------------------------|----------------------|------------------------|--------------------------------------------------------------------|
| <i>W. coagulans</i> , <i>Dun.</i>                  | Abundant.            | Nov. Feb. fl.          | <i>Spán bujja, shá pyang,</i><br><i>khámazare, panírbád, Pers.</i> |
| <i>Physalis viminea</i> , <i>Rox.</i>              | Common in fields.    | Oct. Nov. fl. and fr.  |                                                                    |
| <i>Hyoscyamus pusillus</i> , <i>L.</i>             | Rare.                | April fl.              |                                                                    |
| <i>Datura alba</i> , <i>Nees.</i>                  | Occasional.          | July, Oct. fl. and fr. | <i>Toruldád.</i>                                                   |
| <i>Scopolia pœalis</i> , <i>Dun.</i>               | Very rare.           | March, fl.             | <i>Khurdág ?</i>                                                   |
| <i>Mimulus græchis</i> , <i>Benth.</i>             | Common.              | Oct. fl.               |                                                                    |
| <i>Scrophularia Cabulica</i> , <i>Benth.</i>       | Not uncommon.        | Nov. March fl.         |                                                                    |
| <i>Perpetua Moniera</i> , <i>H. and K.</i>         | Abundant at water.   | Oct. Nov. fl.          |                                                                    |
| <i>Linaria ramosissima</i> , <i>Wall.</i>          | Common on cliffs.    | Ditto ditto ditto.     |                                                                    |
| <i>L. Cabulica</i> , <i>Benth. ?</i>               | Not common.          | April, Nov. fl.        |                                                                    |
| <i>Veronica anagallis</i> , <i>L.</i>              | Abundant at water.   | Most of year fl.       |                                                                    |
| <i>V. agrestis</i> , <i>L.</i>                     | Abundant.            | Feb. March fl.         |                                                                    |
| <i>Celsia Coromandeliana</i> , <i>Vahl.</i>        | Occasional.          | Feb. fl.               |                                                                    |
| <i>Masus rugosus</i> , <i>Lour.</i>                | Abundant in fields.  | March fl.              |                                                                    |
| <i>Antirrhinum orontium</i> , <i>L. β Indicum.</i> | Not uncommon.        | Ditto ditto.           |                                                                    |
| <i>Leptorhabdos parviflora</i> , <i>Benth.</i>     | 4,000 feet.          | Oct. Nov. fl.          |                                                                    |
| <i>Verbascum Thapsus</i> , <i>L.</i>               | Occasional.          | Oct. fl.               | <i>Khur kharnar, spán kharnár.</i>                                 |
| <i>Lindenbergia</i> , <i>sp. ?</i>                 | Ditto.               | Augt. Oct. fl.         |                                                                    |
| <i>Scrophulariaceæ ?</i>                           | Rare.                | Oct. Dec. fl.          |                                                                    |
| <i>Dicliptera Roxburghiana</i> , <i>Nees. ?</i>    | Common among bushes. | July, Oct. fl. and fr. |                                                                    |
| <i>Berberia cristata</i>                           | Rare.                | March, Nov. fl.        | <i>Toro bujja, bhekkar, Punj.</i>                                  |
| <i>Adhatoda vasica</i> , <i>Nees.</i>              | Abundant.            | Oct. Nov. fl.          | <i>Manvande warmande.</i>                                          |
| <i>Rostellularia</i> , <i>sp.</i>                  | Common in fields.    | Oct. Nov. fl.          |                                                                    |
| <i>Vitex negundo</i> , <i>Rox.</i>                 | Abundant.            | March, Nov. fl.        |                                                                    |
| <i>Lippia nodiflora</i> , <i>L.</i>                | Abundant where damp. | Nov. April fl.         |                                                                    |
| <i>Verbena officinalis</i> , <i>L.</i>             | Abundant.            | Augt. fl.              |                                                                    |
| <i>Lantana alba</i> , <i>Mill.</i>                 | Rare 18,200 feet.    |                        |                                                                    |
| <i>Anisomeles ovata</i> , <i>R. Br.</i>            | Rare.                | June, Nov. fl.         |                                                                    |
| <i>Mentha incana</i> , <i>Willd.</i>               | Abundant at water.   | Feb. March fl.         | <i>Pelanne.</i>                                                    |
| <i>Lamium amplexicaule</i> , <i>L.</i>             | Common in fields.    | March fl.              |                                                                    |
| <i>Eremostachys laciniata</i> , <i>Bunge.</i>      | Very rare.           | March, April fl.       |                                                                    |
| <i>Lallemantia Royleana</i> , <i>Benth.</i>        | Abundant.            | March, Sept. fl.       |                                                                    |
| <i>Leucas cephalotes</i> , <i>Spr.</i>             | Abundant in fields.  | April, Nov. fl.        |                                                                    |
| <i>Lycopus Europeanus</i> , <i>L.</i>              | Common at water.     |                        |                                                                    |

| Name of Plant.                         | Frequency.                                | Period of flower or fruit. | Pushtu Name.                            |
|----------------------------------------|-------------------------------------------|----------------------------|-----------------------------------------|
| <i>Salvia pumila</i> , Benth.          | Abundant in dry shingly.                  | July, Nov. fl.             |                                         |
| <i>S. lanata</i> , R. & S.             | Occasional.                               | March, April fl.           |                                         |
| <i>S. glutinosa</i> , L.               | In hills at — feet.                       | July fl.                   | Kharndr.                                |
| <i>S. plebeia</i> , R. Br.             | Abundant in irrigated fields.             | May, June fl.              |                                         |
| <i>S. Moorcroftiana</i> .              | Occasional.                               |                            |                                         |
| <i>Micromeria biflora</i> , Benth.     | Very rare in plain, common at 4,000 feet. |                            |                                         |
| <i>Ballota limbatæ</i> , Benth.        | Common on dry heights.                    | May fl.                    | Spínaghzáí.                             |
| <i>Ajuga paryiflora</i> .              | Common.                                   |                            | Kharbánei.                              |
| <i>Nepeta</i> , sp.                    | 2,000 feet.                               |                            |                                         |
| <i>Colebrookia oppositifolia</i> .     | Occasional.                               | Oct. Nov. fl.              | Shakarandáná.                           |
| <i>Plectranthus rugosus</i> .          | 3,000 feet.                               |                            | Khuangere.                              |
| <i>Tenorium</i> , sp.                  | Rare.                                     | Oct. fl.                   |                                         |
| <i>Labiatae</i> .                      | Occasional.                               | July fl.                   |                                         |
| do.                                    | Rare.                                     |                            |                                         |
| <i>Plantago arenaria</i> , W. and K.   | Abundant.                                 | Nov. March fl.             |                                         |
| <i>P. lanceolata</i> , L.              | Rare.                                     | March fl.                  |                                         |
| <i>P. bauhutula</i> , Edgew.           | Abundant.                                 | Ditto.                     | Spighicol, Punj. isafgol, Hindi.        |
| <i>P. oriantha</i> ?                   | Common.                                   | April, May fl.             |                                         |
| <i>P. Major</i> .                      | Rare.                                     | June, Nov. fl.             | Ghuahba, bartung, Punj.                 |
| <i>Salvadora</i> , sp.                 | Common towards base of hills.             |                            | Plevan, plewane, van, Punj. pñu, Hindi. |
| <i>Gieseckia linearifolia</i> , Schum. | Rare.                                     | Oct. fl.                   | Jau ságe.                               |
| <i>Chenopodium album</i> , L.          | Abundant.                                 | Feb. Nov. fl.              |                                         |
| <i>C. hybridum</i> , L.                | Ditto.                                    |                            |                                         |
| <i>C. Boiya</i> .                      | Not uncommon.                             | June fl.                   |                                         |
| <i>Anabasis multiflora</i> , Moq.      | Abundant.                                 | June, Oct. fl.             | Ghalme.                                 |
| <i>Suaeda fruticosa</i> , Moq.         | Ditto ditto.                              | March, Nov. fl.            | Zamdi.                                  |
| <i>Pandertia pilosa</i> , F. and M.    | Ditto ditto.                              | Sept. fl.                  |                                         |

|                                         |                                    |                        |                                       |
|-----------------------------------------|------------------------------------|------------------------|---------------------------------------|
| <i>Halocharis</i> , sp.                 | Not common.                        | July fl.               | <i>Kordke</i> .                       |
| <i>Atriplex laciniata</i> , Moq.        | Common.                            | Oct. fl.               | <i>Laghme</i> .                       |
| <i>Caryxylon Griffithii</i> , Moq.      | Ditto.                             | March fl.              |                                       |
| <i>C. fetidum</i> , Moq.                | Not uncommon.                      | Oct. fl.               |                                       |
| <i>Chenopodium maritima</i> , L.        | Rare.                              | July fl.               |                                       |
| ↳ <i>Salsola Kali</i> , L.              | Not common.                        | Augt. fl.              |                                       |
| ↳ <i>Eurus Javanica</i> , Juss.         | Profuse.                           | Nov. March fl.         |                                       |
| ↳ <i>Achyranthes aspera</i> , L.        | Common.                            | Oct. Nov. fl.          |                                       |
| <i>Pupalia lappacea</i> , A. DC.        | Not uncommon.                      | Nov. fl.               |                                       |
| <i>Amarantus polygonoides</i> .         | Abundant.                          | July, Nov. fl.         |                                       |
| <i>A. polygamus</i> , L.                | Ditto.                             | July, Oct. fl.         |                                       |
| <i>Digera arvensis</i> , Forsk.         | Abundant in fields.                | Ditto, ditto.          |                                       |
| <i>Alternanthe raesessilis</i> , R. Br. | Abundant at water.                 | Ditto, ditto.          |                                       |
| <i>Celosia argentea</i> , L.            | Abundant in fields.                | Oct. Nov. fl.          |                                       |
| <i>Boerhaavia diffusa</i> , DC.         | Abundant.                          | Nov. fl.               | <i>Issit, Punj.</i>                   |
| <i>Polygonum Persicaria</i> , L.        | Occasional in damp.                | Oct. Nov. fl.          |                                       |
| <i>P. lapathifolium</i> ?               | Not uncommon.                      | Nov. Feb. fl.          | <i>Banduke</i> .                      |
| <i>P. aviculare</i> .                   | Abundant.                          | Feb. Oct. fl.          |                                       |
| <i>P. barbatum</i> , L.                 | Abundant in water, &c.             | Nov. April fl.         |                                       |
| <i>P. flaccidum</i> , Meisn.            | Ditto ditto.                       | Oct. Nov. fl.          |                                       |
| <i>Bumex acutus</i> .                   | Abundant.                          | Feb. July fl.          | <i>Zagukei</i> .                      |
| <i>B. vesicarius</i> , L.               | Abundant in dry places.            | March, April fl.       | <i>Trāhī, saṭānī, Punj.</i>           |
| <i>R. hastatus</i> , Don.               | Occasional.                        | April, June fl.        |                                       |
| <i>Thymelæa arvensis</i> , Lam.         | Abundant in fields.                | Oct. fr.               |                                       |
| <i>Alnus</i> , sp.                      | Rare.                              |                        | <i>Gira</i> .                         |
| <i>Quercus Ilex</i> .                   | Khyber Pass at — feet.             |                        | <i>Sere, cherei</i> .                 |
| <i>Salix Babylonica</i> ?               | A common tree.                     | Feb. fl.               | <i>Walo, wila, wale</i> .             |
| <i>Populus alba</i> , L.                | A common tree, occasionally wild ? | Fl. or fr. never seen. | <i>Speedor, spēda, sufedor, Pers.</i> |
| <i>Ficus caricoides</i> , Rox.          | Common.                            | Nov. fr.               | <i>Anzar, phvgu āro, Punj.</i>        |
| <i>F. infectoria</i> .                  | Rare.                              |                        |                                       |
| <i>F. Bomburghii</i> .                  | Ditto.                             |                        |                                       |
| <i>Forstählea tenacissima</i> , L.      | Common.                            | Oct. March fl.         |                                       |
| <i>Pouzolzia ciliaris</i> , Wedd.       | Common at damp.                    | July, Nov. fl.         |                                       |
| <i>Muscisaya hypoleuca</i> , Wedd.      | Rare.                              |                        | <i>Shakei</i> .                       |

[sageni.

Spārke, speravanne, aznet,  
Kātre.

| Name of Plant.                       | Frequency.                             | Period of flower or fruit.         | Pushra Name.       |
|--------------------------------------|----------------------------------------|------------------------------------|--------------------|
| <i>Pouzolzia</i> , sp.               | Rare.                                  | March fl.                          |                    |
| <i>Cannabis sativa</i> , L.          | Common in waste places.                | May, Oct. fl.                      |                    |
| <i>Pinus longifolia</i> , Rox.       | At 3,500 feet on north side of valley. | Dec. young fruit, April old ditto. | Nakhtor.           |
| <i>Asparagus</i> , sp.               | Common.                                | July, Nov. fl. and fr.             | Vel, Kuchan, Punj. |
| <i>A. racemosus</i> , Rox. ?         | Rare                                   |                                    |                    |
| <i>Butomus umbellatus</i> , L.       | Not uncommon in water.                 | July fl.                           |                    |
| <i>Sagittaria sagittifolia</i> , L.  | Common in water.                       | Nov. April fl.                     |                    |
| <i>Alisma Plantago</i> , L.          | Not uncommon ditto.                    | July fl.                           |                    |
| <i>A. reniforme</i> , Don.           | Rare ditto.                            | July fl. ?                         |                    |
| <i>Tulipa stellata</i> , Hook.       | Abundant in fields.                    | March fl.                          | Shundai.           |
| <i>Allium leptophyllum</i> , Wall. ? | Profuse ditto.                         | March, April fl.                   |                    |
| <i>Asphodelus fistulosus</i> , L.    | Abundant ditto.                        | Ditto, ditto                       |                    |
| <i>Juncus articulatus</i> , L.       | Occasional.                            | April fl.                          |                    |
| <i>J. bufonius</i> , L.              | Ditto.                                 | Ditto, ditto.                      |                    |
| <i>Commelynium communis</i> , L.     | Very rare.                             |                                    |                    |
| <i>Zeuxine sulcata</i> , Lind.       | Not uncommon.                          | April fl.                          |                    |
| <i>Iris</i> , sp.                    | Abundant in fields.                    | March fl.                          |                    |
| <i>Hydrilla verticillata</i> .       | Abundant in water.                     |                                    |                    |
| <i>Vallisneria spiralis</i> .        | Uncommon in water.                     | Fl never got.                      |                    |
| <i>Potamogeton perfoliatus</i> , L.  | Common.                                | Oct. fr.                           |                    |
| <i>P. crispus</i> , L.               | Not uncommon.                          |                                    |                    |
| <i>P. gramineus</i> , L.             | Common.                                | Nov. fr.                           |                    |
| <i>P. natans</i> , L.                | Ditto.                                 |                                    |                    |
| <i>Zaannichellia palustris</i> .     | Occasional.                            | Nov. fr.                           |                    |
| <i>Chamaerops Richiana</i> , Griff.  | Abundant, low hills, &c.               | June, July fl. and fr.             | Mzare.             |
| <i>Typha angustifolia</i> , L.       | Profuse in water.                      | July fr.                           | Lakh.              |
| <i>T. latifolia</i> , L.             | Rare.                                  | Ditto, ditto.                      |                    |
| <i>Lemna minor</i> .                 | Abundant.                              | Ditto, ditto.                      |                    |
| <i>L. trisulca</i> .                 | Common.                                | July.                              |                    |
| <i>Cacchrus echinatus</i> , L.       | Not common.                            | Augt. Oct. fl.                     |                    |

|                                            |                      |                  |                               |
|--------------------------------------------|----------------------|------------------|-------------------------------|
| <i>Aristida setacea</i> , Retz.            | Common.              | April, Oct. fl.  | <i>Spinvege</i> .             |
| <i>A. sp.</i>                              | Rare.                | Nov. fl.         |                               |
| <i>Heteropogon contortus</i> , R. and S.   | Occasional.          | Augt. fl.        |                               |
| <i>Andropogon gryllus</i> , L.             | Abundant.            | July, Oct. fl.   | <i>Warbushai, Kharanvash.</i> |
| <i>A. Bladhi</i> , Retz.                   | Ditto.               | March, Nov. fl.  |                               |
| <i>A. involutus</i> , Steud.               | Rare.                | Augt. Oct. fl.   |                               |
| <i>Chrysopogon Arnottianum</i> ?           | Occasional.          | Oct. fl.         |                               |
| <i>Pennisetum dichotomum</i> , Del.        | Rare.                | Ditto.           |                               |
| <i>P. araneosum</i> , Edgew.               | Occasional.          | Nov. fl.         |                               |
| <i>P. cenchroides</i> , Rich.              | Abundant.            | April, May fl.   | <i>Bushke.</i>                |
| <i>Chloris villosa</i> , Pers.?            | Common.              | April, Nov. fl.  |                               |
| <i>Eragrostis cynosuroides</i> , R. and S. | Ditto.               | June, Nov. fl.   |                               |
| <i>E. poaeoides</i> , Beauv.               | Ditto.               | Ditto, ditto.    |                               |
| <i>Rothbucellia hirsuta</i> , Vahl.        | Not uncommon.        | June, Sept. fl.  |                               |
| <i>R. glabra</i> , Rox.                    | Common at water.     | April, July fl.  |                               |
| <i>Cymbopogon Iwarancusa</i> , Schult.     | Common.              | Sept. Nov. fl.   | <i>Ghewargá, drámbi.</i>      |
| <i>Arundo Karka</i> , Rox.                 | Ditto.               | Oct. fl.         | <i>Kaé.</i>                   |
| <i>Saccharum exaltatum</i> , Rox.?         | Ditto.               | July to Dec. fl. | <i>Shamákha.</i>              |
| <i>S. four other, sp.</i>                  | More or less common. | July, Oct. fl.   |                               |
| <i>Panicum maximum</i> , Jacq.             | Not uncommon.        | Augt. Nov. fl.   |                               |
| <i>P. colonum</i> , L.                     | Abundant.            | Nov. fl.         |                               |
| <i>P. repens</i> , L.                      | Occasional.          | Augt. Nov. fl.   |                               |
| <i>Digitaria sanguinalis</i> , Pers.       | Abundant.            | March, Nov. fl.  |                               |
| <i>Setaria glauca</i> , Beauv.             | Ditto.               | Augt. Oct. fl.   |                               |
| <i>Dactyloctenium Egyptianum</i> , Willd.  | Not uncommon.        | March, April fl. |                               |
| <i>Kelleria cristata</i> ?                 | Common.              | Ditto, ditto.    | <i>Spin rakhei.</i>           |
| <i>K. phleoides</i> .                      | Ditto                | Ditto, ditto.    |                               |
| <i>Poa annua</i> , L.                      | Not uncommon.        | June, Nov. fl.   |                               |
| <i>P. sp.</i>                              | Common.              | April, Nov. fl.  |                               |
| <i>Agrostis alba</i> , L.                  | Ditto.               | Augt. fl.        |                               |
| <i>A. sp.</i>                              | Occasional.          | March, Nov. fl.  | <i>Barará.</i>                |
| <i>A. sp.</i>                              | Ditto.               | Most of year fl. |                               |
| <i>Cynodon dactylon</i> , L.               | Abundant.            | April, Oct. fl.  |                               |
| <i>Elesine flagellifera</i> , Nees.        | Common.              | Augt. Nov. fl.   |                               |
| <i>E. sp.</i>                              | Occasional.          |                  |                               |



| Name of plant.                        | Frequency.                       | Period of flower or fruit. | Pushtu Name. |
|---------------------------------------|----------------------------------|----------------------------|--------------|
| <i>Polygonum Monspelierensis</i> , L. | Common where damp.               | June, Nov. fl.             |              |
| <i>Lamarckia aurea</i> , Maench.      | Common.                          | April fl.                  |              |
| <i>Alopecurus pratensis</i> , L.      | Common in fields.                | April, May fl.             |              |
| <i>Avena fatua</i> , L.               | Not uncommon in fields.          | April fl.                  |              |
| <i>Phalaris Canariensis</i> , L.      | Common in fields.                | Ditto, ditto.              |              |
| <i>Bromus mollis</i> , L.             | Common.                          | Ditto, ditto.              |              |
| <i>Imperata Konigii</i> .             | Abundant.                        | April, Nov. fl.            |              |
| <i>Nardus stricta</i> ?               | Not uncommon.                    |                            |              |
| <i>Pappophorum</i> , sp.              | Occasional.                      | June, Nov. fl.             |              |
| <i>Sorghum Halepense</i> .            | Common in fields, &c.            | July, Nov. fl.             |              |
| <i>Lappago biflora</i> , Rox.         | Rare.                            | Augt. fl.                  |              |
| <i>Apinda aristata</i> .              | Ditto.                           |                            |              |
| <i>A. geniculata</i> , Rox.           | Not uncommon.                    | Sept. Nov. fl.             |              |
| <i>Isachne</i> , sp.                  | Occasional.                      | Augt. fl.                  |              |
| <i>L. sp.</i>                         | Not uncommon.                    | Sept. Nov. fl.             |              |
| <i>Opismenus stagninus</i> , Kunth.   | Common in ditches, &c.           | June, Nov. fl.             |              |
| <i>Paspalum Kora</i> , Willd.         | Rare.                            | Oct. Nov. fl.              |              |
| <i>Lolium temulentum</i> .            | Not uncommon in fields.          | May, June fl.              |              |
| <i>Hordeum</i> , sp.                  | Rare.                            | March, April fl.           |              |
| <i>Festuca</i> , sp.                  | Not uncommon.                    | March fl.                  |              |
| <i>Stipa</i> , sp.                    | Rare.                            | May, June fl.              |              |
| St sp.                                | Ditto.                           | June fl.                   |              |
| <i>Anatherum muricatum</i> .          | Not common, local.               | Oct. fl.                   |              |
| <i>Melica</i> , sp.                   | Rare.                            | Nov. fl.                   |              |
| <i>Cyperus rotundus</i> , L.          | Profuse in irrigated fields, &c. | June, Nov. fl.             |              |
| <i>C. exaltatus</i> , Retz.           | Abundant in water.               | July, Nov. fl.             |              |
| <i>C. mucronatus</i> , Rottb.         | Abundant.                        |                            |              |
| <i>C. niveus</i> .                    | Not uncommon.                    | Augt. fl.                  |              |
| <i>C. capillaris</i> , Ram.           | Abundant.                        | July, Nov. fl.             |              |
| <i>C. difformis</i> , L.              | Common.                          | June, Nov. fl.             |              |

|                                                                                                                         |                                 |                               |           |
|-------------------------------------------------------------------------------------------------------------------------|---------------------------------|-------------------------------|-----------|
| <i>C. Haspan</i> ?                                                                                                      | Not uncommon.                   | Nov. fl.                      |           |
| <i>Fimbristylis ovalis</i> , Nees.                                                                                      | Rare.                           | Ditto. fl.                    |           |
| <i>F. dichotoma</i> , Vahl.                                                                                             | Common.                         | Nov. March fl.                |           |
| <i>F. sp.</i>                                                                                                           | Ditto.                          | July, Nov. fl.                |           |
| <i>Eriophorum comosum</i> , Wall.                                                                                       | Occasional.                     | Nov. fl.                      |           |
| <i>Malacochaste pectinata</i> , Nees.                                                                                   | Not uncommon to 2,500 feet.     | Augt. Nov. fl. ?              |           |
| <i>Eriocharis palustris</i> , Br.                                                                                       | Abundant.                       | June, Nov. fl.                |           |
| <i>Scripus maritimus</i> , L.                                                                                           | Ditto.                          |                               |           |
| <i>Carex Wallichiana</i> , Presc.                                                                                       | Ditto.                          |                               |           |
| Cyperaceae.                                                                                                             | Not uncommon.                   | March, July fl.               |           |
| Do.                                                                                                                     | Rare.                           |                               |           |
| Do.                                                                                                                     | Not uncommon.                   |                               |           |
| Do.                                                                                                                     | Occasional.                     |                               |           |
| Do.                                                                                                                     | Not uncommon.                   |                               |           |
| Do.                                                                                                                     | Common.                         |                               | Kuátzei.  |
| <i>Adiantum Capillus Veneris</i> , L.                                                                                   | Abundant in edges, ditches, &c. |                               |           |
| <i>Pteris longifolia</i> .                                                                                              | Occasional.                     |                               |           |
| <i>Lastroa Thelypteris</i> , Presl. ?                                                                                   | Ditto.                          |                               |           |
| <i>Marsilea quadrifolia</i> , L.                                                                                        | Profuse in water.               |                               |           |
| <i>Salvinia</i> , sp. ?                                                                                                 | Rare.                           | July, Oct.                    |           |
| Azolla.                                                                                                                 | Ditto.                          | July.                         |           |
| <i>Marchantia</i> , sp.                                                                                                 | Abundant.                       |                               |           |
| <i>Equisetum debile</i> , Roz.                                                                                          | Ditto.                          |                               |           |
| <i>Riccia frutians</i> .                                                                                                | Ditto.                          |                               |           |
| <i>R. natans</i> .                                                                                                      | Common.                         |                               |           |
| <i>A. chatra</i> , nitella ( ? ) a conferva, a<br>moss, and 2 plants of doubtful N.<br>Orders, all more or less common. |                                 | Sept. Nov. fl.<br>July, Sept. | Bandakei. |

The number of plants in the foregoing list amounts to 467, of which 348 are dicotyledonous, 105 monocotyledonous, and 14 acotyledonous, and these are distributed in about 320 genera, and 95 natural orders; thus the natural orders are to the genera as 1 to 3.45, and to the species as 1 to 4.91.

377 out of the whole species have been specifically identified, but of these must be excluded 8 species with regard to the general distribution of which I have not sufficient data to render them available for *any* calculations as to the geographical relations of the Peshawur Flora.

Of the 369 species thus left to be dealt with in this connexion, 188 belong to the ordinary Indian Flora, while those plants which are found at various heights in the Himalaya, amount to 123, 39 species being common to both the Himalaya and the plains.

One circumstance which comes out strongly in the examination of the plants of Peshawur, is that here in the plains a great many species, (many of them European,) are indigenous, which to the Eastward of the Punjab are only found in the Himalaya (or at similar heights in the Neilgheries, &c.) It has long been familiarly known that a considerable number of European species of herbaceous plants inhabit the plains of the N. W. Provinces. These generally flourish "in the cold season," to use Dr. Royle's phrase, but with regard to many of them, *spring* is the season of active growth, as I have been able to verify by observation during the early months of 1861, 1862 and 1863. All of these extend also into the Punjab, and the circumstance with which we are now concerned, goes to prove what otherwise would appear very likely, viz. : that the further North West we proceed, the greater is the number of (European and) Himalayan plants found in the plains. I shall here give a list of those plants which, near Peshawur, I have found below 1500 feet above the sea-level, but which have not been found in the plains of the North West Provinces, (to the East of the Sutlej)—many of them, so far as my information goes, having been found at such low elevations in the extreme North West Punjab only;—but my means of obtaining data regarding the distribution of many of even the Indian species of plants, have, from my isolated position, and the want of libraries, &c.,—been so limited, that I have doubtless inserted some plants which ought to be excluded from this list.

Of the 68 species, those marked B. are British, those marked E. are found in other parts of Europe, while the rest are Himalayan plants.

- B. *Ranunculus arvensis*, *L.*
- R. lætus*, *Wall.*
- ? *Adonis æstivalis*, *L.*
- E. *Ceratocephalus falcatus*, *Mench.*
- B. *Lepidium ruderales*, *L.*
- E. *Malcolmia africana*, *R. Br.*
- Goldbachia lævigata*, *DC.*
- Euclidium Syriacum*, *DC.*
- B. *Sisymbrium Sophia*, *L.*
- E. *Neslia paniculata*, *Desv.*
- B. *Arenaria serpyllifolia*, *L.*
- Sageretia oppositifolia*, *Brongn.*
- Rhamnus virgatus*, *Rox.*
- Rhus Kakrasinghi*, *Royle* (*acuminata*, *DC.* ?)
- B. *Medicago maculata*, *Willd.*
- B. *Trifolium repens*, *L.*
- ? B. *Lotus angustissimus*, *L.*
- B. *Rubus fruticosus*, *L.*
- R. lasiocarpus*, *Sm.*
- Grislea tomentosa*, *Rox.*
- B. *Herniaria hirsuta*, *L.*
- B. *Sium angustifolium*, *L.*
- B. *Tillæa muscosa*, *L.*
- B. *Galium aparine*, *L.*
- ? B. *G. tricornis*, *With.*
- ? B. *Asperula cynanchica*, *L.*
- B. Taraxacum officinale*, *Wigg.*
- ? *Gnaphalium multiceps*, *Wall.*
- Lactuca auriculata*, *Wall.*
- Koelpinia linearis*, *Pall.*
- B. *Centaurea calcitrapa*, *L.*
- ? *Aplotaxis candicans*, *DC.*
- B. *Bidens cernua*, *L.*
- B. *Samolus Valerandi*, *L.*
- Olea Europæa*, *L.*

- Nerium odorum, *L.*
- ? Orthanthera viminea, *Wight.*
- B. Lithospermum arvense, *L.*  
Lantana alba, *Mill.*
- ? Eremostachys laciniata, *Bunge*  
Lallemantia Royleana, *Benth.*
- B. Lycopus Europæus, *L.*
- ? Salvia pumila, *Benth.*  
S. lanata, *Rox.*  
S. Moorcroftiana, *Wall.*  
Micromeria biflora, *Benth.*
- ? Ajuga parviflora, *Benth.*
- B. Plantago lanceolata, *L.*
- ? Gieseckia linearifolia, *Schum.*
- E. Chenopodium Botrys, *L.*
- E. Atriplex laciniata, *Moq.*  
Rumex hastatus, *Don.*
- ? Salix Babylonica, *L.*
- B. Populus alba, *L.*  
Ficus Roxburghii, *Mig.*
- B. Alisma Plantago, *L.*  
A. reniforme, *Don.*  
Tulipa stellata, *Hook.*  
Allium leptophyllum, *Wall.*
- B. Juncus articulatus, *L.*
- ? Cymbopogon Iwarancusa, *Schult.*
- B. Poa annua, *L.*
- B. Phalaris Canariensis, *L.*
- B. Bromus mollis, *L.*  
Eriophorum comosum, *Wall.*  
Carex Wallichiana, *Presc.*
- B. Lastræa Thelypteris, *Presl.*  
Riccia fluitans, *L.*

The number of British species found in the Peshawur valley amounts to 100, being a very large proportion of the number of species (Hooker and Thomson give 222) common to Britain and India, and of this number the following twenty species have not,

so far as I am aware, been hitherto found in the Himalaya, or in the plains to the East of the Punjab.

- Sisymbrium Irio, *DC.*
- Lepidium Draba, *L.*
- Frankenia pulverulenta, *L.*
- ? Euphorbia Helioscopia, *L.*
- E. Peplus, *L.*
- Erodium maritimum, *L. Her.*
- E. cicutarium, *L.*
- ? Cichorium Intybus, *L.*
- Lycopsis arvensis, *L.*
- Plantago major, *L.*
- Suaeda fruticosa, *Moq.*
- Chenopodina maritima, *L.*
- ? Salsola Kali, *L.*
- ? Typha latifolia, *L.*
- Lemna minor, *L.*
- Digitaria sanguinalis, *Pers.*
- Koeleria cristata, *Pers.*
- Agrostis alba, *L.*
- Alopecurus pratensis, *L.*
- Nardus stricta, *L.*

The number of Central and Southern European species of plants, (exclusive of such as are also found in Great Britain) included in the Peshawur Flora, is 61.

African species, continental and insular, occurring in the Peshawur valley, amount to 146, and it is worthy of note that among these are 11 out of 14 identified Peshawur Cyperaceæ, and 30 out of 44 Grasses.

Of the Peshawur species, 101 have been found in the region comprising the Caucasus, Asia Minor, Syria and Persia.

The species of Siberia, Mongolia, and Central Asia (north of Tibet) are 59, of which 43 are common also to the last section.

The Arabian species amount to 41, of which 18 are found in the Persian region also.

The species collected at Peshawur, and common to it with Afghanistan, Beluchistan and Sind, are 47, of which the following appear

not to have been as yet found elsewhere than in these three regions, excepting one or two which are indigenous also in some parts of the Punjab, Cis-Indus.

*Papaver cornigerum*, *Stocks*.  
*Crotalaria Burhia*, *Ham*.  
*Reptonia buxifolia*, *A. DC*.  
*Withania coagulans*, *Dun*.  
*Scrophularia Cabulica*, *Benth*.  
*Linaria Cabulica*, *Benth*.  
*Plantago eriantha*, *Dne*.  
*Anabasis multiflora*, *Moq*.  
*Caroxylon Griffithii*, *Moq*.  
*Chamærops Ritchiana*, *Griff*.

The following 32 are characteristic Punjab species, many of which extend to the more arid tracts near Delhi, some even (as *Cocculus Leæba*) to dry parts of the Peninsula, and of which many are also found in Arabia or Africa, while a few (as *Fagonia cretica*, *Plantago arenaria*, and *Forskählea tenacissima*) extend to the South of Europe.

*Cocculus Leæba*, *Forsk*.  
*Oligomeris glaucescens*, *Dne*.  
*Cleome Ruta*, *Jacq*.  
*C. linearis*, *Stocks*.  
*Mollugo Cerviana*, *Seringe*.  
*Crozophora tinctoria*, *Juss*.  
*Fagonia Cretica*, *L*.  
*Peganum Harmala*, *L*.  
*Acacia modesta*, *Wall*.  
*Carthamus oxyacantha*, *Bieb*.  
*Filago Germanica*, *L*.  
*Berthelotia lanceolata*, *DC*.  
*Francœuria crispa*, *DC*.  
*Pulicaria vulgaris*, *Gærtn. ?*  
*Trichogyne cauliflora*, *DC*.  
*Rhazzya stricta*, *Dne*.  
*Periploca aphylla*, *Dne*.  
*Dæmia extensa*, *R. Br*.  
*Tecoma undulata*, *Don*.  
*Heliotropium Europæum*, *L*.

*H. brevifolium*, *Wall.*  
*Nonnæa Edgeworthii*, *DC.*  
*Scopolia præalta*, *Dun.*  
*Ballota limbata*, *Benth.*  
*Plantago arenaria*, *W. & K.*  
*P. bauphula*, *'Edgew.*  
*Forskählea tenacissima*, *L.*  
*Cenchrus echinatus*, *L.*  
*Pennisetum dichotomum*, *Delile.*  
*P. araneosum*, *Edgew.*  
*P. cenchroides*, *Rich.*  
*Chloris villosa*, *Pers. ?*

A few of the Peshawur plants, 36, are found also in China or Japan, but of these many are of very wide distribution throughout the world, and the same remark applies to 78 species that are common to Peshawur and Australia, as well as to 97 species that occur also in America, continental or insular.

Of the 369 Peshawur species, 135 are found in at least three out of the five great divisions of the globe. Of these, however, a considerable proportion do not extend, in Africa and Europe, far from the Mediterranean, so that although occurring in three continents, they are not so widely distributed as the mere statement of the latter fact would appear to indicate.

The results of the above may be thus briefly stated ; Indian species, 188 ; Himalayan, 123 : common to the plains of India and the Himalaya, 39 ; Himalayan, which have been found in the plains to the west of the Sutlej only, 68 ; British species, 100, of which 20 have not been found to the east of the Sutlej ; of South Europe, 61 ; African, 146 ; of Caucasus, Asia Minor, Syria or Persia, 101 ; of Siberia and Central Asia, 59, of which 43 occur also in the preceding section ; Arabian, 41, of which 18 are common also to Persia, &c. ; of Affghanistan, Beluchistan and Sind, 47, 10 of these being peculiar ; of Punjab and arid tracts of India, 32 ; of China and Japan, 36 ; Australian, 78 ; American, 97 ; and occurring in at least three of the five continents, 135.

I shall conclude this already too lengthy paper by some remarks on a few of the species individually, noting those circumstances



in regard to their frequency, the uses to which they are put, &c., which seem to deserve attention.

*Ceratocephalus falcatus* does not appear to have been previously found anywhere at the plain level in India, and I only got a very few plants on one occasion in the Peshawur district, at a place where I failed altogether to find it in the succeeding season. It occurred abundantly in central Waziristan, north west from Dehra Ismail Khan, at about 7,000 feet above the sea.

*Delphinium penicillatum* is common in the lower hills round the valley, but as my specimens were lost, it is not included in the list.

*Cocculus Leæba* is a common plant, but only on dry precipitous banks, where also (I might almost add where only) *Capparis spinosa* and *Ehretia aspera* are very generally found.

Immense quantities of *Nelumbium speciosum* grow in one part of the Peshawur marsh, where it has probably been introduced, and to which myriads of its flowers give a very gay appearance in July. The right of collecting the seeds and roots (the latter dug in October) is leased out, both being eaten by natives.

The (new ?) species of *Malcolmia* is in many parts of the valley an abundant weed, and the widespread masses of its pretty purple-lilac flowers have attracted the notice of the European residents, by whom it is frequently called "heather." I have seen it as far east as Hussan Abdál, but it is not contained in an extensive collection of plants, made by Dr. J. E. T. Aitchison, at and near Jhelum. Specimens of it as well as of *M. Africana*, frequently occur with white flowers. The species of *Notoceras* is also common and may be new. It is a small, inconspicuous herb.

I cannot find that *Euclidium Syriacum*, *Alyssum calycinum*, *Sisymbrium Sophia* or *Neslia paniculata* have previously been collected in the plains anywhere to the east of the Sulimán range. Near Peshawur, all except the two last, are with *Malcolmia Africana*, abundant.

*Oligomeris glaucescens* is by no means common, nor are *Cleome Ruta*, *C. droserifolia*, and *C. linearis*, as I only knew of one or two stations where each of these could be found.

*Capparis aphylla* (*Sodada decidua*, Forsk.) though not universal, is in some parts of the district abundant.

*Flüggea virosa* was not found in the valley, the only tree I saw in that neighbourhood being *Cis-Indus*, but it occurs frequently beyond the Indus to the South of Peshawur.

*Grewia oppositifolia* is probably the plant (in Pushtu *pastawane*, literally "soft tree") mentioned by Vigne as that from which the inhabitants of the Sulimán range make their bows. It is frequent Trans-Indus, and is the *dáman* of the Punjab, where its elastic wood is used for making buggy-shafts, banghy-sticks, &c.

*Dodonæa Burmanniana* is one of the most characteristic plants of the dry rocky lower ranges to 4000, feet, Trans-Indus. It is a very handsome evergreen shrub, and does admirably for hedges. This plant is often called "bog-myrtle" by Europeans, why I know not.

*Peganum Harmala* is probably the most common of the larger herbaceous plants from Peshawur to Dehra Ismail Khán, and is doubtless the species "like Devil in the Bush," alluded to by Elphinstone as common near Peshawur, and surmised by Royle (appendix to Vigne's Kashmir) to be *Nigella-sativa*.

The *Haplophyllum* was only found in one spot, in one season.

*Celastrus parviflora* is one of the characteristic plants of the dry tracts near the base of the hills; it grows to be a largish shrub.

The new (?) species of *Sageretia* (*mámání*) is also very common in similar places to the last, and throughout the Trans-Indus hills generally to 4,000 feet. Its fruit which is not unlike the bilberry, is small, but when fresh is pleasant and sweet. It is the *maimunna* of Griffiths and is well-known in the bazars of Peshawur and Affghánistán.

Under *Rhamnus virgatus* have probably been confounded two species, one (or both) of which is common on most of the Trans-Indus hills.

Of *Rhus Kakrasinghee* (*acuminata*?) in Pushtu *shne*, I have only seen a very few trees beyond the Indus; Griffith hints at the *shne* (*schnee*) of Affghánistán being a *Xanthoxylon*. This name has at different times been applied by Affgháns to each and all of the species of *Rhus* and *Pistacia* that I have ever shewn them. The present species produces beautifully marked wood—the *Kakkar* of the Himalaya—for furniture, desks, &c.; and is subject to the growth of large, red, fleshy excrescences upon its leaves (as is also the case with *Pistacia Cabulica* or *Atlantica* in Belúchistán, according to Stocks,) which are employed medicinally by the natives.

*Crotalaria Burhia* was not met with in the Peshawur valley, although it is common near Campbellpore, a few miles to the east of Attock, and abundant at many places to the south of Peshawur. The

fibres of its bark are of great strength, but I am not aware of this property being taken advantage of for economical purposes.

*Acacia modesta* is an abundant and characteristic shrub. Its flowers in spring have a most agreeable and powerful odour, easily felt at a distance of many yards to leeward of a bush in full blossom; and it furnishes good but very small timber, suitable for making ploughs, &c.

*Medicago maculata* and *Trifolium repens* do not appear to have been previously found in the plains of India, but the one is common and the other occasional near Peshawur and in the Trans-Indus districts generally.

*Acacia catechu* and *Butea frondosa* might have been included in the list of Peshawur Leguminosæ, as they were collected (though both are very rare) in the district. They have, however, been excluded, as the specimens were lost at Nowshera—with the other results of my first two seasons botanizing in the valley—in the flood of the Cabul river, caused by the great Indus cataclysm of 1858.

On two occasions only were very young plants of *Rubus lasiocarpus* found, in the beds of streams, and they may have been seedlings accidentally brought down from the hills.

*Trapa bispinosa* is by no means common and has possibly been introduced.

*Grislea tomentosa* was found only close to the Swát river near its débouchement from the hills.

*Tamarix orientalis* is one of the trees very commonly planted about villages, &c., and I am not sure that I have ever seen it wild. It is a very handsome tree and *looks* a shady one (indeed, Elphinstone alludes to its shade as being extremely sombre,) but in reality, its slender, rod-like branches, with very minute leaves, afford a most inadequate defence from the sun, as experience soon teaches the frontier campaigner. Its wood is of little value.

The only Compositous plant that seems to require special notice is *Carthamus oxyacantha* which is abundant throughout the valley. An oil is extracted from its seeds which is both burned and used in cookery. Its parched seeds are eaten, and when ground, they are made into bread which is considered very nutritious. Col. Sykes gives similar information with regard to the uses of the allied *Carthamus* (*Onobroma*) *Persicus*.

I may remark that here, as elsewhere in the Punjab and in the N. W. Provinces, *Anagallis arvensis* is always the variety  $\beta$  *cærulea*, while every specimen I saw in the valley of Kashmir, had the usual scarlet corolla of the British plant.

*Reptonia buxifolia* is a large shrub common towards the skirts of the hills, and to 3,000 feet, throughout the Trans-Indus districts. Its wood is small but hard and fine grained, and its fruit is the well-known *gurgura* of the Affghans, collected in April for sale, but which is miserable eating, and by no means deserves their panegyrics.

*Olea Europæa* is very common, Trans-Indus, as well as throughout the Western Punjab, in similar situations to the last. It is a small tree, furnishing a good deal of strong hard wood used for making agricultural implements, and for the kneed timbers of boats, &c. The supply for the Government boat-yards at Attock is brought chiefly from the direction of Niláb. Elphinstone mentions that its fruit is eaten both fresh and dried, by the Sheraunees, but I could discover no trace of such an usage among the Affgháns, and the amount of fleshy pericarp is very much less than in the European olive.

*Rhazzya stricta* is here (as further east in the Punjab) a characteristic shrub, being so abundant in some parts of the valley that its dried branches are commonly used as fuel. It seldom exceeds 2 or 2½ feet in height, and its resemblance to the oleander (noted by Vicary in his paper on the Sind Flora, J. A. S.) accounts for its Pushtú name being a modification of the Hindustáni name of the latter.

*Periploca aphylla*, which occurs as far east as the hills north of Jhelum (and in the Salt range near that place where it was first found in India by Jacquemont), and which is common in most places Trans-Indus (to Sind, see Vicary) is so abundant in some parts of the valley, as to be in common use as fuel. In one place, Cis-Indus, the young shoots are eaten as *ság*.

The species of *Boucerosia*, not yet determined (I have only been fortunate enough to get it once in flower and fruit) has a distribution similar to that of the *Periploca*, than which it is, however, very much less abundant. The appearance of its bunches of short tetragonal stems has suggested its Persian name *panj angusht*, five fingers, and one of its Punjábí names *chár angli*, four fingers. Its taste is intensely bitter, and as in the case of most plants which have a very decided flavour, salutary effects are attributed to it by Patháns and Punjabis.

by both of whom it is eagerly eaten. This is probably Griffiths' "Stapelioides, eaten as a vegetable" found by him in the Khyber Pass and appears to be the plant alluded to by Masson (Vol. II. p. 80) which however he calls "a lichen."

*Tecoma undulata* is not uncommon in the Peshawur valley as elsewhere, Trans-Indus. It has by far the largest corolla of any wild plant I collected in the Punjab, and its gorgeous orange-coloured blossoms present a striking appearance in April and May.

*Cuscuta reflexa* is by no means rare, and is the only parasitical plant found in the plain near Peshawur. (*Viscum album* is, however, evidently common above a certain height in the hills around, as it was at once recognized and named, both fresh and dried, by Tira men, who stated it to be frequent in their country).

A yellow-flowered variety of *Heliotropium Europæum* (or a different species?) was only got in two places, and is probably the "*Heliotropium flavum*" found by Griffith near Jellalabad.

The unnamed species of *Nonnæa* (flower white, that of *N. Edgeworthii* being rose-coloured in all my specimens,) I only found in successive seasons in one field where it was abundant.

*Arnebia echioides* is common near Peshawur, as elsewhere beyond the Indus, and in March and April its pretty yellow flowers enamel the ground in many places where it occurs in profusion. It has a pleasant smell, and under the name of the "Prophet-flower" is held in much esteem by the Affghans (but not to the south of the Trans-Indus salt range so far as I could learn) who attribute the five dark spots upon its corolla to the pressure of Mahomed's fingers. I do not know of its having been found to the East of Hussan Abdal, there being some doubt as to specimens collected near Jhelum by Dr. Aitchison, but its congener *A. hispidissima*, which occurs in the Kohat Pass, is common in Rohilkhund, and is enumerated by Dr. Anderson in the flora of Lucknow.

*Lithospermum arvense* is an abundant field-weed in spring, and *Lycopsis arvensis* occurs sparingly in waste places.

*Ehretia aspera* is frequently found, Trans-Indus, on dry precipitous banks, but always much more stunted than in the lower North-West Himalaya.

*Withania coagulans* is an abundant small shrubby plant and extends eastward at least to Jhelum. Its Persian name *panir bad*

implies, and information received from Dr. Bellew regarding the practice at Candahar, authenticates its occasional use in Affghanistán as a coagulant, but this does not appear to be the case at Peshawur. Masson mentions its seeds as being useful in colic, &c., and this seems probable from the known sedative effects of *W. somniferum*.

*Hyoscyamus pusillus* was only found, in successive years, in one place, where it was pretty common in several fields.

Of *Scopolia præalta* only one plant was found near Peshawur, but I have frequently got it at places further to the south.

It is rather singular that although *Solanum gracilipes* is common beyond the Indus about Kohát and to the south, (as in the Cis-Indus salt range when Jacquemont originally collected it) it was nowhere got in the Peshawur valley.

The species of *Dicliptera* is abundant in shady spots every where, Trans-Indus, and *Adhatoda vasica* is, near Peshawur, as elsewhere in the Punjab and North West Provinces, a very common plant.

*Mentha incana* is profuse by canals, &c. In one spot many plants occurred having each spike contracted into a quasi-capitulum.

Of *Eremostachys laciniata*, in successive seasons, no more than a single plant was to be found.

*Ballota limbata* is common in dry rocky places near the skirts of the valley. It extends eastward at least to Jhelum.

Of *Plantago bauphula* there are two tolerably distinct varieties, both of which are abundant. Both *Plantago major* and *P. lanceolata* are very rare, and only found near water; while *P. eriantha* (?) is common in the most arid spots.

*Salvadora* is frequent towards the base of the hills. In some places, Trans-Indus, powerful aphrodisiac qualities are attributed to the fruit of this plant, but it is probable that the circumstances under which it is collected—where the male and female inhabitants of whole villages turn out into the “jungle” to gather it,—rather than any quality of the fruit itself, afford an explanation of the results attributed to the latter.

No fewer than twelve species of *Salsolaceæ* are found, most of them being very common, near Peshawur, and several additional species were got beyond the Indus to the south of the valley. We may note this in connection with the two or three species of this order found wild in the N. W. Provinces, and the twenty-two species (as given

in Decandolle's Prodrromus) contained in Griffiths' Affghanistán Herbarium, while in the Siberian Flora, the number is very much larger still. Of those found in the Peshawur district the most common are *Anabasis multiflora*, *Suæda fruticosa*, *Caroxylon Griffithii*, and *Panderia pilosa*, the last being the tallest and most bushy. So far as I am aware none of the Salsolaceæ are here applied to any use, but I understand that in the arid tracts between Lahore and Múltán, immense quantities of an impure alkali are extracted from the ashes of several of them (known by the general name of *lâne* or *lána*) for export to other districts.

*Ærua Javanica* is very abundant, and grows in the driest places, often to upwards of five feet in height. It varies much in habit and in the form and size of its leaves.

*Rumex vesicarius* is common in dry rocky or shingly situations. *R. hastatus* is only found at some height above the plain.

*Thymelæa arvensis* is an abundant field weed, with a marked variety less common than the ordinary form.

The species of *Alnus* was only met with near the debouchement of the Swát river from the hills, near which place it is common, but stunted.

*Quercus Ilex*, I procured from the Khyber Pass where it must be abundant, as its wood is one of the commonest brought in for fuel to the cantonment of Peshawur.

*Forskählea tenacissima* is not uncommon on dry rocky spots. It varies very much in habit, being sometimes short stemmed, low and scrambling, and at others tall, erect and half-shrubby. Its leaves also vary much according to age, in texture and "tenacity."

*Pinus longifolius* I have collected at about 4,000 feet above the sea, in the hills to the North-East of the valley, and I procured it from the hills above Abazái towards Swát, where it is said to be abundant. It is notable that there should be none (nor was *Quercus Ilex* met with) on the hills to the south of the valley, which rise to 5,000 feet above the sea. Nor did we reach it on the Wazíri expedition into the Sulímán range North-West of Dehra Ismail Khán, when we attained 8,500 feet, and where its lower limit (forests of it were seen above us, and I picked up its cones in stream-beds)—was certainly not under 9,000 feet. The comparative drought has doubtless much to do with this. The Affghán name of the tree is *nakhtar*,

under which *Cedrus Deodara* also appears to be included. The word *shātutai* (mentioned by Griffith and Irvine) is only applied to its resinous splinters used for torches and firewood.

An undetermined species of *Asparagus* is common here, as in many parts of the Western Punjab; while *A. racemosus* is very rare.

*Alisma reniforme* occurred only in one spring, which fact may possibly be connected with the temperature of the latter, which is very equable, and always considerably higher than that of the air in winter and spring.

*Allium leptophyllum*, *Asphodelus fistulosus*, *Tulipa stellata* and a species of *Iris* are all abundant in the fields in spring, when the gaudy flowers of the two last present a very gay appearance.

Of *Commelynium communis* I only found a single plant. *Zeuxine sulcata* is not uncommon in dampish places.

The various species of *Fluviales* are all abundant in most pools or slow running streams.

*Chamærops Ritchiana* (possibly identical with *C. humilis*, the most northern and only European Palm) is not got close to Peshawur itself where the supply has probably been completely used up—but very large quantities of it are brought in from places a few miles off, where it is gregarious and covers extensive tracts, for the manufacture of mats, ropes and sandals, &c. The hillmen make a tobacco pipe from a single segment of a leaf by twisting it up spirally; and when the ends of all the segments of a leaf are tied together, it is used as a way-side drinking vessel. The mossy looking rete lying inside the base of the petiole is used as tinder for which it answers admirably. Though I have not seen this plant to the East of the Indus, and Dr. Fleming in his Report (in J. A. S.) on the Salt Range, does not mention it as growing there, yet I am informed on good authority that it is found on the top of Sarkesar in that range.

*Typha angustifolia* is abundant in all marshes but it is superseded as a material for mats, for which it is used in the N. W. Provinces, &c., by the *Chamærops*, from which a much stronger and more lasting article is made. The seeds of the *Typha* are used as a binding material for wall plaster, and to the South of Peshawur, the leaves are employed as thatch.

Of the Peshawur grasses a large number grow in very dry situations and of these the following are the most prominent; *Aristida*



setacea, *Heteropogon contortus*, *Pennisetum cenchroides*, *Chloris villosa* (?), *Rottbœllia hirsuta*, *Andropogon Bladhii*, *Cenchrus echinatus*, *Eleusine flagellifera*, and the species of *Pappophorum*.

The proportion of grasses to the whole of the plants collected in the Peshawur district, about 60 to 460 (more than one-eighth) seems very large when we consider that the number of grasses in the Indian Flora to the total number of Phanerogamous species found in India, including the Himalaya and Ceylon, is given by Hooker and Thomson as about 400 to 12,000 or one-thirtieth. A comparatively large number of grasses were also obtained in the Trans-Indus districts, hill and plain, south from Peshawur to near Dehra Ismail Khán, the proportion to the number of plants collected being more than one-tenth (about 65 to 640).

The Cyperaceæ are also numerous at Peshawur, about 20 to 460 species; I am not aware that any of them is applied to any special economical purpose.

Of Ferns, *Adiantum Capillus Veneris* is common on the sides of wells (as it is in the N. W. Provinces, though Royle does not mention it as found there,) and in shady places by ditches, &c.; *Pteris longifolia* and *Lastræa Thelypteris* (?) are both uncommon.

*Marsilea quadrifolia* and *Equisetum debile* are both profuse in damp places, as are *Riccia natans*, *R. fluitans*, and *Azolla*, floating on, and *Chara*, immersed in water.

In bringing to a conclusion these notes on the Peshawur Flora, I have to express my exceeding regret that owing to various unavoidable causes, so many of the species should still remain unidentified. As among these there will probably be a considerable number new to India, when circumstances permit of their identification, I may beg for admission into the Journal of the Society of a corrected list with remarks, so as to furnish a more complete view of the Flora than is at present possible. Meanwhile I have preferred sending the present imperfect paper, to incurring the indefinite delay that may occur before all the species can be thoroughly compared and named with certainty; knowing as I do from bitter experience, from how much vexation the possession of even such a catalogue as I have been able to give here, would save the tyro in Indian botany who commences his labours in the Upper Punjab.

*Remarks on a stone inscription from the ruins of Pu-gán on the Irrawaddy river.—By Lieut-Col. A. P. PHAYRE, C. B. Bengal Staff Corps.*

Among the ruins of the city of Pu-gán are numerous ancient inscriptions, generally on slabs of sandstone, which being soft, and the slabs having for centuries been exposed to the weather, the inscriptions have for the most part become much worn, and are now difficult to be read. Many of these inscribed stones have been removed by order of the king of Burmah to the capital. Those which remain at Pu-gán are seldom found in their original places, but have been collected chiefly within the enclosure of one Pagoda called Baudi-Phrá. Some years ago when at Pu-gán I took rubbings of several of the inscriptions, but from want of leisure, have never set seriously to work to decipher them. At length I commenced with one, the date of which was legible, and which had the merit of being short. With the help of two Burmese literati, Moungh Shwé Hlau and Moungh Tá, I have been able to decipher it. The inscription possesses no historical interest, but may be of use as showing the form of letters existing among the Burmese at the time it was engraved, and so be a key to other and more valuable writings. For this reason the original rubbing is sent, and a copy in modern Burmese character, with an English translation, and notes, are added.

The inscription is unsatisfactory, as it does not give even the name of the person making the gifts which it records. Very different in this respect is the conduct of the bestower, to that of the modern Burmese, who take care to record carefully their names when they build a religious or charitable fabric. The language of the inscription is homely Burmese, with such few Pali words as the nature of the subject required. In later times a man would have despised the vernacular, and have recorded his good deeds entirely in flowing Pali. The language is quite intelligible, though the meaning of a few words is still doubtful. Considering that the inscription is now, (in A. D. 1862), six hundred and seventy-three years old, it is wonderful that so few of the words have become obsolete.

The inscription records that the donor from sincere feelings of respect to "the three treasures, Budha, his law and his ministers,"

bestows or presents certain land, and agricultural implements, in order that pure milk, or a preparation of rice-milk, or milk and honey, may be available; and after blessing those who assist in the good work, the inscription concludes with dreadful imprecations on those who destroy it. While the donor is not mentioned, though one word implies a royal benefactor, nothing is even said as to whom the offering is intended for; but perhaps that would have been indecorous, as it was probably a gift to a monastery, and Buddhist monks, not only theoretically must be dependent on daily charity for their food, but must be utterly indifferent to it, except to support life for the purpose of practising virtue. But milk is not taken as food by grown up people in Burmah; or at all events is only lately beginning to be used. Possibly the milk may have been intended for foreign Buddhist monks from Ceylon, who, there is reason to believe, about the time of the inscription, were not unfrequently at Pu-gán.

Some explanatory notes have been added to the inscription. The original consists of eighteen lines, and the copy in modern characters is written to correspond with it.

*Copy of the inscription in modern character.*

- ၁ သကရစ်၅၅၁သရဝန်နှ
- ၂ စတပိုင်တွဲဆိုတ်၅ရက်ခါန့အစစ်နှ
- ၃ စင်ခဲတုတရာသဃရတ္တနာသုပါးတိုင်နှိုက်
- ၄ သန္တိကြည်ညိုဝိစွာရွယ်ပျူသောနို့တန်းခဲဂျာ
- ၅ ကိုင်ရတ္တနာသုပါးအားပစ္စည်းပျစ်စိပ်သောဌာ
- ၆ အစစ်နှိုစင်ခဲလွှတ်မှုသောမြေကစိပ်လယ်အရေနှိုက်
- ၇ ပိုးဆုံဆေချင်အရပ်စင်ရှင်ရွာရောက်မြော်ကာ
- ၈ အနောက်သိုင်းနှင်းကြီးချောင်ပေါက်ရင်နှင်းသောလယ်၅

၉ ဝ။စေတုသည်မန်ကြွင်၅ဝ။မန်ကြာ၅ဝ။ပျင်၅ဝ





- ၁၀ စကြာရေပုဂ်၁၀။ချင်ရှိမိတ်၁၀။တံကျက်မြေ၁၀။  
အပေါင်
- ၁၁ ၎၁၀။ဤငါဖြူသောကောင်မှုကိုစိပင်ပါသောသူကား။  
နှစ်ရေ
- ၁၂ ယျရုထိနေရစေရည်ကောင်မှုကိုသွပ်ကြောဖျက်ဆီ
- ၁၃ နှိုင်းသောရယူသသူကားမြေကြိုမျှင်စေသော။ မိုးကြိုး  
ဇေ
- ၁၄ သော။ရှင်လူရှာစေသော။ကြာစာစေသော။မီးကြောင်  
စာဇေ
- ၁၅ သော ဂနိယံပျက်စေသော။သွေခဲအရုပ်တါစေ  
သော။ခံရန်ဘေ
- ၁၆ လည်ရေခံစသော လုပ်သရာပျက်စိစေသောသေ  
စေသောရစ်
- ၁၇ မူဂရှည်၎င်း ပုတ်နှိဟိဟိမြည်လျက်ဗုရုထုံ
- ၁၈ ဟိုက်တ တ်သောဗြမနက်ဘေဖျင်စေသတေ

*Translation of the Inscription.*

In the era 551\* the Tharawan year, the fifth day of the waning moon Tabodwai, (bearing in mind) the offering of pure milk curds,† made sincerely from a well disposed regard to Phra (Budha) (his) law (and his) ministers, (therefore I in order to provide) milk-curds,

\* The existing era of the Burmese, commences with the vernal equinox of the year A. D. 638. All their astronomical knowledge is derived from the Hindus, (or Budhists of India) and formerly each year used to be designated in succession, by one of the lunar mansions of the Hindu system. Thus in the inscription, the year 551 is called Tharawan, which answers to Sravanah the 22nd lunar mansion of the Hindus. The waning moon Tabo-dwai falls in February. The inscription was executed in the year 1189 A. D.

† Offering of pure milk. The composition of this inscription is, like all ancient, and indeed most modern, Burmese writings, so elliptical, that much of the meaning has to be guessed at. In this sentence it is possible that the offering of *ga-nha*, milk and honey, made to Gautama, after six years of fasting and mortification by Thoodzata is alluded to.

(and) cows,\* to be the property of the three treasures, royally bestow† pure milk curds (and) rice-producing land;‡ \* \* \* \* in quantity at the place (called) Po-oon-tshay-tsyeng until you reach the village Tsagyo, and from the north to the west until you reach the Nhen-gyee§ stream, (what is) my own (that I) bestow, rice land (in extent) 50;|| digging spades 50; broad spades 50;¶ planks 50;\* ploughs 50;† sickle handles divided 110; earth rakes 50;‡ in all 410. This my good work the men who have assisted, may they remain a hundred years; (but) that my good work, the loose destructive men, who would make away with, (it) may the earth swallow (them up); may the thunderbolts strike them; may the clergy and laity avoid them; may tigers devour them; may crocodiles eat them, to-day may they be destroyed; may their blood harden and become corrupt;§ may calamity, enmity, and evil overtake them;|| may all their endeavours come to nought; may they die; with giddiness,¶ may they have a disgusting stench in the body, with distressing skin disease; with shivering,\* and may evil follow them day and night.

\* The word in the inscription rendered "cows" reads ဂဠာ or ခုရှာ if the last it may be a Pali word for cow; if the first it is bad spelling for ဂဏ္ဍာ "honey and milk," or "rice and milk."

† Royally bestow. The word here rendered royally, is in the inscription spelt differently to the present mode of spelling that word; indeed it is an abbreviation not now in use, yet it is difficult to suppose it to represent any other word. At the same time no other phrase in the whole inscription indicates a royal donor.

‡ The word connected with "rice-producing land" left blank in translation as not understood, may be the name of the place where it is situated.

§ It appears there is a small stream at Pu-gán still called Nhen-gyee.

|| "Rice land fifty." Probably the mere figures at that time sufficiently indicated the area of the land. If they meant the produce in bushels the land might be three or four English acres.

¶ Some obsolete words not understood precede the word "spade."

\* Planks are much used in land prepared for irrigation, to preserve the ridges which retain the water.

† The word for plough is obsolete, but I am informed is still known in some parts of upper Burmah.

‡ The spelling of the word for rakes differs from that of the present day.

§ Here the stone begins to be broken, "blood become corrupt," the words of the original are doubtful.

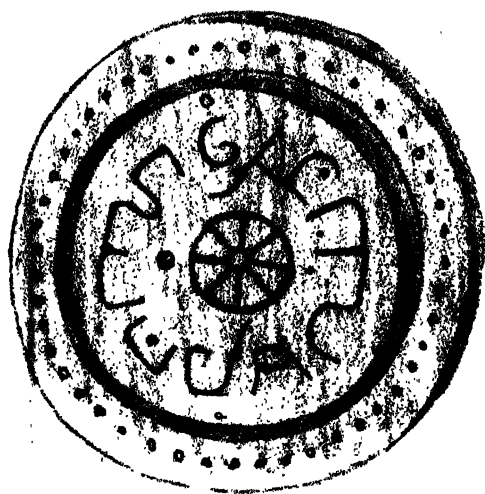
|| "Overtake them." The words are inserted from the context where the stone is broken.

¶ After "giddiness" words broken away.

\* After "shivering" words broken away.







*Plate XI.*



*Memorandum on some medals and coins in the Museum of the Asiatic Society, found near Mergui on the Tenasserim Coast.—By Lieut.-Col. A. P. PHAYRE, C. B., Bengal Staff Corps.*

The coins or medals found near Mergui and presented to the Society by Professor Oldham, have nothing to indicate the year when they were cast. Their metal appears to be a mixture of tin and lead. Tin is found in plenty in that part of the country. Possibly some of them may have been made for circulation as money, but that is doubtful. It has never as a general rule been usual to coin money in the Burmese empire for currency. When Arakan was conquered in 1784 A. D. the Burmese Governors issued a coin in imitation of the custom observed by the Kings of Arakan, who again had learnt the practice from the Mahomedan Kings and Governors of Bengal.\* It is possible that on the Tenasserim coast within the present districts of Tavoy and Mergui, where tin is found, coins may have been made for general use, more especially as those districts have occasionally belonged to the Siamese, who have copper coins and formerly even stamped glass. It appears to be the opinion of the people of the coast also, that these coins were formerly used as money and as weights. As, however, the large medals, numbers one to six of the plate, contain religious symbols, the fact of their common circulation is doubted by many inhabitants of the northern portion of Burmah whom I have consulted regarding them. It is more probable that they were made for the purpose of being deposited in Pagodas.

There are sixteen large coins in good preservation, which contain only three different varieties. Of the smaller coins only six are sufficiently preserved to be described. None of them contain any date nor any king's name. They are probably recent, that is coined within the last hundred years. I shall now proceed to describe those coins of the collection which are figured on the accompanying plates the exact size of the originals :—

No. 1.—*Obverse*.—The figure of a fabulous animal in the Burmese mythology called ဝိသုဒ္ဓိ: *Tó* or နယာ: *nayá* a compound of flying horse and deer.

*Reverse*.—An inscription in the Pali language, Burmese character as follows :

\* See Journal of Asiatic Society, Vol. XV. p. 232.

မဟာသုခိဏာဂရံ

Translation. "Land of great happiness," or "great happiness for people of (the) land."

The letters all read backwards from the die having been stupidly prepared without reference to the stamped or cast surface from it, coming out reversed. The inscription surrounds a wheel or circle, the symbol of Budha, "emblematic," says Col. Cunningham, "of the passage of the soul through the circle of the various forms of existence," and here typifying as shown by the inscription the attainment of the great object, nirvána, rest in the happy land.

No. 2.—This coin is from a different die to No. 1, but the device is generally the same. There is no difference in the inscription which is shown reversed.

No. 3.—In this medal the animal intended to be represented is the same as in the others; the inscription is also the same; but this time is written correctly. The wheel here has only six compartments there being eight in the others. Each compartment also has a small circle within it.

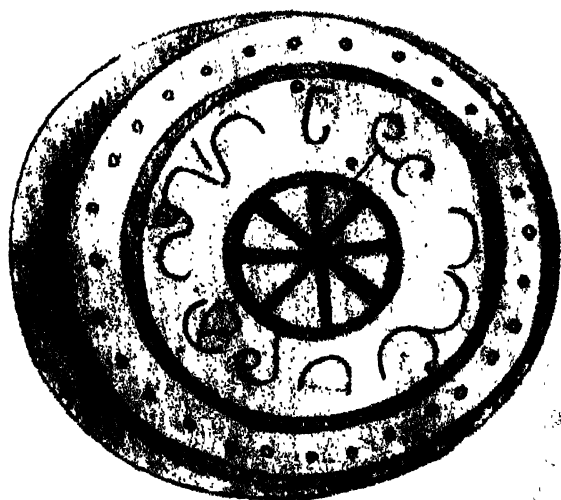
No. 4.—No material difference. Underneath the animal on the obverse, is a six-rayed star; on the reverse, is the same inscription as before, and the central wheel or circle with eight compartments.

The popular idea among the Burmese regarding these medals is, that they were cast by order of the king called Bau-dau-phra, who reigned from 1782 to 1819 A. D.; that he feared losing the remote maritime province of Tenasserim and trusted to some supernatural power by means of these medals to preserve his province from foreign invasion, and thus secure "great happiness for the people of the country." This is a very far-fetched and unlikely interpretation. I think it much more probable that the medals are the work of a provincial Governor for a local purpose. They appear indeed to be quite unknown to people of good education from upper Burmah, to whom I have shown them.

No. 5 is of a different type from the preceding. The obverse is a bird of no earthly form. The reverse bears what appear to be Burmese characters, but of which no meaning can be made.

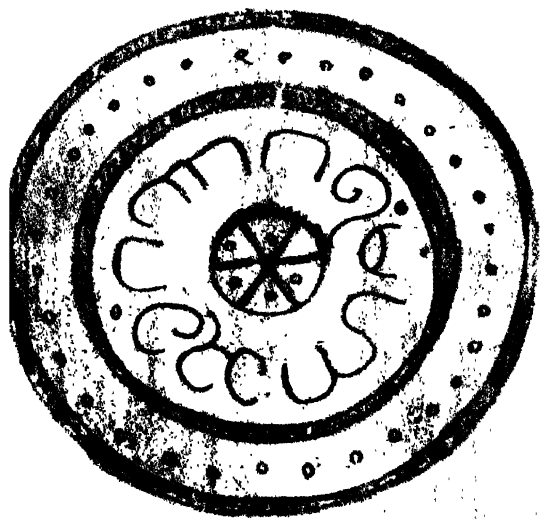
No. 6 is a medal which I am not prepared to explain, but the reverse with the square symbol in the centre is apparently a rude

*Plate XII.*



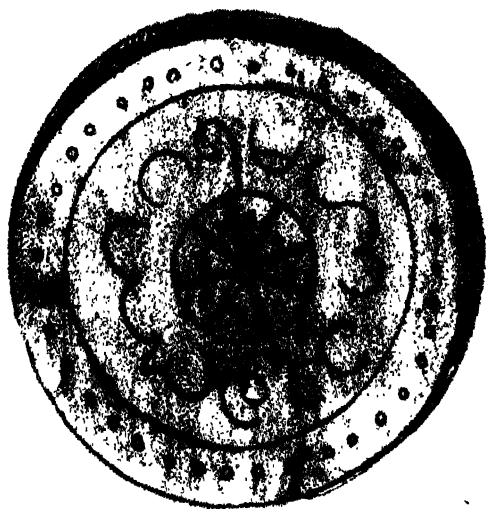


*Plate XIII.*





*Plate XIV.*



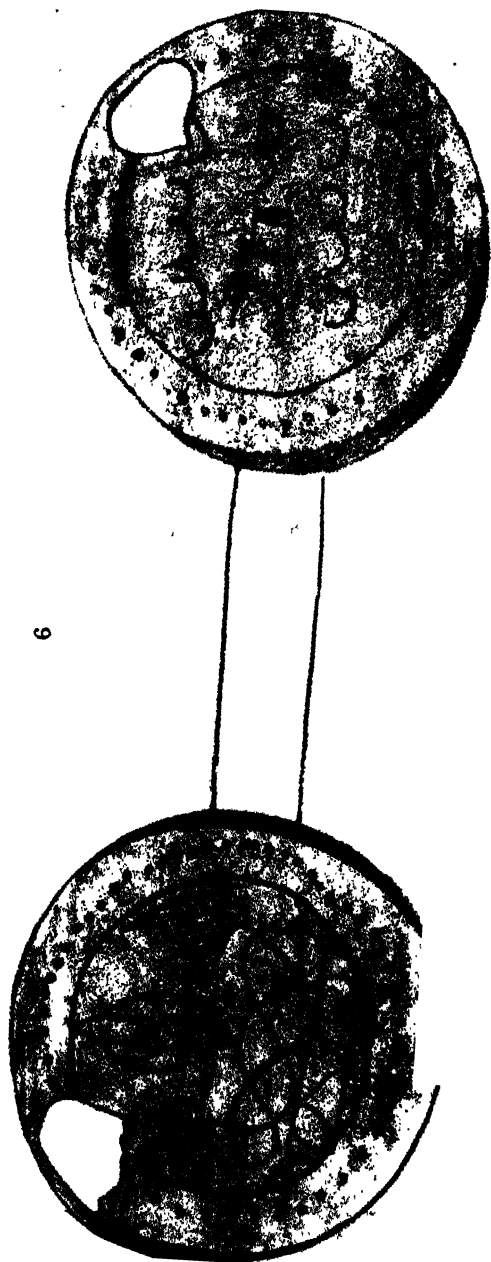




*Plate XV*









representation of the chaitya of ancient Buddhist coins with central relic chambers. The obverse may possibly represent a lotus bud.

Of the numerous small coins in the collection only six can be in any way deciphered. These are figured in the plate and marked Nos. 7 to 12 inclusive. The obverse in these coins appears generally to contain a figure meant to represent a lion. In one instance, No. 8, the figure is evidently a humped cow. At first sight the reverse of these coins appears to bear traces of Burmese letters. Indeed some of the marks do make veritable letters of the Burmese alphabet. But no meaning can be extracted from them, and I incline to look on these six small coins, as copies of ancient Buddhist coins made by ignorant workmen, who, in copying the common chaitya symbols, have made random marks like Burmese characters. But the symbols in the coins marked 8 and 11, evidently differ from the rest. I am unable to offer any probable explanation of them.

*Two Ancient Sanskrita Inscriptions from Central India ; texts, translations and comments.—By BĀBU RĀJENDRALĀLA MITRA.*

In my papers on Toramāpa and the kings of Gwalior I have noticed nearly all of Major General Cunningham's collection of Inscriptions from Central India of which any sense could be made out. Of the few which remained to be decyphered, most were full of lacunæ and otherwise imperfect, and I have therefore returned them to their owner, for such use as he may deem fit to make of them in his forthcoming essay on the history of the celebrated stronghold of the Kachvahas. There were two, however, which were sufficiently legible to admit of trustworthy interpretations ; and transcripts and translations of these I now offer to the readers of the Journal.

The first is from a small Jain temple at Kajraha, nine coss from Chhatterpur, which is on the high road from Saugor to Hamirpur. It is incised on a small slab nine inches square, the lines, eleven in number, being, with one exception, just eight inches long.

Its language is pure Sanskrita, but the metre of its poetical portion is defective, and the spelling throughout incorrect, the dental sibilant being every where used instead of the palatal and the cerebral, and the cerebral being in one place used in the place of a *kḥ* as in the modern Hīndvi.

The subject of the record is the donation, by one Bhabya Páhila, of six small plots of garden land and a house for the use of a temple ; it is dated, Monday the 7th of the waxing moon in the month of Vaisákha, Samvat 1011 = A. D. 954.

When I first read the inscription I took the cypher in the date to be a 7, as I felt it difficult readily to believe, that the modern Devanágari, the character used, could be associated with the Samvat date 1011, but finding the figure 7 differently given at the foot of the record, I had no alternative but to take it for a dot. The idea of 7 was suggested by a twisted tail at the right hand of the cypher which in modern Nágari cannot be expected in any other figure. Its presence, however, has been accounted for by General Cunningham, who says, " I have satisfied myself by personal examination that the figure one was first engraved and afterwards changed to 0."\*

The inconsistency regarding the association of so early a date as the tenth century, with very modern characters, General Cunningham explains by assuming the record to be a recent transcript of an ancient document. In a private letter (dated 10th November, 1860) to Mr. A. Grote, commenting on my translation of the inscription, he observes : " Of the short inscription from Kajraha (or Khajuráha) I have little to say. The date has puzzled Rájendra on account of the modern style of the letters ; but the date can only be one of two, either 1011 or 1111, (better 1711). I believe that the inscription may have been engraved any time during the last 300 years, from a more ancient copy. My reasons I will give in detail when giving my note on the Khajuráha kings. I may mention, however, for Rájendra's satisfaction, that I copied in the same Jain temple an inscription, but without date, which is word for word the same as the other down to the enumeration of the gifts. I say word for word, but not letter for letter, as this other shorter inscription has no mistakes in it of one s for the other, and is besides in comparatively old characters, on the pedestal of a Jain figure."

The donor, a Jain, calls himself the respected of Rájá Dhánga, and gives away, among several parcels of garden land, a house and premises of the name of " Dhánga bádi." This would imply him to have been either a near and elder relative of Dhánga, or a priest. The latter is not likely, as a Páhilla, according to General Cunningham,

was the founder of the Dhānga dynasty, and it is therefore likely that the donor with the same name was a member of this family, though there is of course nothing to prevent his being a priest. Any how, as he is neither a royal nor a historical personage, the knowledge of his identity is of little interest to the antiquarian. The fact, however, of his having been a contemporary of Dhānga in 1011 Samvat, settles the chronology of a long line of princes who exercised supremacy in Bundelkhand eight hundred years ago.

The first mention of Dhānga occurs in a record published by the late Lieut. W. Pierce in the 12th Vol. of the Asiatic Researches (p. 357). The document was found inscribed on a large stone in the vicinity of the town of Mhow about ten miles distant from Chatterpur, i. e., very near the same place whence the monument now under notice has been brought. It was mutilated at its beginning and end, owing to the stone having been used for grinding the knives and axes of the neighbouring peasants. Enough, however, was left, to afford a pretty connected account of nine chieftains and their ministers. The first chief of the roll was Dhānga Deva, who, after a long and prosperous reign, destroyed himself by drowning at the holy junction of the Ganges and Jumna opposite Allahabad. The last of his line was Madanavarma, who was, according to his historiocrast, "a conqueror of the glories of Chedi, Kás'í and Málava." The document gives no date, but judging from the circumstance of its having been from the same locality whence our Kajraha stone has been obtained, and from the age of the ruins where they were found, it would not be, for Indian history, too presumptuous, to assume the identity of the Dhāngas named in the two records.\* But we have more than a presumption to establish their identity. In a large inscription found at Kajraha by Capt. Burt and decyphered by the late Mr. J. C. C. Sutherland,† we have the genealogy of a Kajraha chief named Banga, who, in the Samvat era 1019 = A. D. 962, "consigned his mortal coil to the confluence of the Ganges and Yamuná" at Prayága. Now this Banga can be no other than the Dhānga of our inscription, and I have the authority of General Cunningham, who has examined the original stone, to state that the reading of Mr. Sutherland, owing of course to the imperfection of the facsimiles he

\* The credit of discovering the identity is due to General Cunningham, vide Ante, vol. XXIX. p. 394.

† Ante vol. VIII. p. 159.



had before him, is defective in many respects, and that his Banga is a mislection of Dhānga. Thus then we have the era of Dhānga established by two inscriptions to be 1011 to 1019 Samvat, in the last year of which he committed suicide. How long before 1011 he had assumed the sovereignty of Kajraha, we have no means to ascertain. His panegyrist assigns him a long life of "109 autumns," a good portion of which he must have spent in the exercise of his sovereign powers; it would not be too much, therefore, to assume that he reigned for at least fifty or sixty years, or Samvat 960 to 1019 = A. D. 902 to 962.\* If we allow the usual average of eighteen years to each reign to six of his predecessors, the founder of his family would be placed 852 S. = 795 A. D., and the same average to eight of his successors would bring down the last of his race with whose name we are acquainted, Madanavarma, to S. 1173 = A. D. 1116. This would be, however, too early by two reigns, as the Kajraha inscription of Capt. Burt is dated "Friday, the 3rd of the waxing moon in the month of Vais'ākha S. 1173" = A. D. 1116 when Jayavarma, the grandfather of Madana, caused the eulogium of his ancestor Dhānga to be transcribed from an old and ill-written document into the "Kakuda" or, as correctly guessed by General C. "Kumuda" characters. If allowance be made for this discrepancy, the average of the six reigns after Dhānga would come up to 25½ years, which would be considerably more than the usual average of Indian reigns; but inasmuch as the chieftains of Kajraha were petty kings, or more probably vassals, enjoying from generation to generation the little principality, without being exposed to those vicissitudes which are incident to extensive sovereignty, their reigns should assimilate more to the average of human generation than to Indian reigns. And if this be admitted, thirty to thirty-three years should be assigned to each life rather than twenty-six. At the last named rate, which I accept to be on the safe side, Madana would be removed to the middle of the 12th century, and the chieftains of Kajraha for near four hundred years be thus arranged, the years being of course mere averages except in the cases of Dhānga and Jayavarma's dates.

\* General Cunningham says that he has got a long inscription of Dhānga, dated 45 years before his death. The "109 autumns," according to the same authority, is a mislection of "upwards of a hundred autumns." *Satam samadhi-kam.* Aste XXIX. p. 295.

|                                                   |               |
|---------------------------------------------------|---------------|
| I.—Nannuka, .....                                 | A. D. 746—771 |
| II.—Vágyati or Vákpati according to General C.,   | 772—797       |
| III.—Vijaya, ... ..                               | 798—823       |
| IV.—Vihala or Ráhila according to General C., ... | 824—849       |
| V.—S'ríharsha, .....                              | 850—875       |
| VI.—Yasodharma Deva, son of V., .....             | 876—901       |
| VII.—Dhánga, son of VI., .....                    | 902—962       |
| VIII.—Gaṇḍa Deva, son of VII., .....              | 962—988       |
| IX.—Vidyádharma Deva, son of VIII., .....         | 999—1014      |
| X.—Vijáya Pála, son of IX., .....                 | 1015—1040     |
| XI.—Kirttivarma Deva, son of X., .....            | 1040—1066     |
| XII.———Varma Deva, son of XI., .....              | 1066—1092     |
| XIII.—Jayavarma* Deva, brother of XII., .....     | 1092—1118     |
| XIV.—Sallakshaṇa Varma, son of XIII., .....       | 1118—1144     |
| XV.—Madanavarma, son of XIV., ... ..              | 1144—1170     |

Of the history of these chieftains I shall here say nothing. General Cunningham has lately obtained a Hindví poem, containing a chronicle of the principality of Kajraha, a summary of which, now under his pen, will, I have no doubt, throw much more light on the subject, than any thing that I can compile from the meagre inscriptions at my disposal.

The second inscription is from Ratanpur in the province of Nagpur. It is inscribed on a temple of Mahádeva, and measures 2 feet 6 inches by 14 inches. The face of the stone on which it is recorded, is in a good state of preservation, and perfect facsimiles in intaglio may be taken off, by impressing on it moistened paper with the hand. Col. Cunningham's facsimile has been so prepared, and the depressions have been since filled up with ink, but the operation having been carelessly done, the ink-tracing, instead of proving a help to the reader, often misleads him. In decyphering the record, I have, therefore, followed the relief side which, though reversed, is nevertheless more trustworthy than the former.

The character used for the inscription is intermediate between the Kuṭīla and the modern Devanágari, with several letters which seem peculiar to the era of the document. The *t* and the *bh* have been written almost alike, the lower arm of the one being slightly rounded,

\* Mr. Sutherland had a notion that Jayavarma was the son of Dhánga, but the inscriptions completely refute his idea.

while in the other it is angular. The *bh* of this type, however, is not invariably used. The Kuṭila *bh*, resembling the modern *h*, is promiscuously used with the former. *B*, *v* and *ch* are written alike. At the end of the first line, which is about  $\frac{1}{3}$  shorter than the rest, several characters are scratched at the end, which cannot be made out; probably they were of the same type as those of the rest of the inscription, but owing to partial obliteration they now look different. The second and third lines have several letters of the same kind. The last letter of every line, as also the initial letters of the 22nd, 23rd and 24th lines, are lost.

In regard to style, the inscription offers little for comment. Sanskrit poetry of the later middle ages is noted for its unchaste ideas, silly conceits, and over-strained metaphors; and the author of the record under notice, is in every way true to the age he lived in. An eager attempt to make up for the poverty of ideas by a pruriency of diction, pervades his composition, and the erotic tendency of his thoughts assails him even in his salutation to his gods. The language, however, is generally correct, and there is little to complain of against the engraver Sāmpulā.

The subject of the record is not of much interest. It is said that in the reign of Prithudeva son of Ratnapāla, King of Chedi, modern Rewa and Mundla,\* who was a prince of the lunar race, a Brāhmaṇa of great learning came from Chedi to the Turmaṇa country, and one of his descendants, in the year 1150 A. D., dedicated a temple to Ś'iva, in the village of Sāmbāgrāma. The locality of Turmaṇa must be assumed, from the position of the temple, to be the district around Ratnapur, and for the origin of the name, we must look to the prince of the Gwalior inscription published in the last volume, whose dominion extended to the west as far as Bhopal and perhaps farther. By the testimony of the inscriptions and coins extant, it has been there shewn that Toramāna was a prince of some renown, and the association of his name with the country, several centuries after his death, may be taken as an additional proof in support of that opinion.

The name of the dedicator of the temple is indistinct, the syllables *de*, *va* and *na* are alone legible, with a hiatus after *va* barely sufficient for a single letter, which I suppose was a *g*. If this guess be correct, the name would be Devagaṇa, probably an *alias* of the Devadāsa

\* Vide Journal American Oriental Society, vol VI. p. 18.

described in a preceding part of the record. Ráyera Siñha, the sixth in\* descent from Gobinda, the founder of the family from Chandail, was probably his father. But the family panegyrist, after naming Bhopá the daughter of Ráyera, celebrates the intimacy of the two brothers Balha and Devadása without saying a word as to their descent. A Devagaṇa occurs as the composer of the record and he is said to be the son of Ratna Siñha, but whether that Ratna Siñha was the son of Máme or a different person, does not appear; probably he was different, as otherwise the recital of three generations after the composer would be scarcely called for; and it would be difficult to account for the poet being, in sad breach of Hindu manners, so very particular as to who was the most favourite wife of his own son, and an octogenarian contemporary of his great-grandson writing erotic poetry.

Kunárápála, son of Avanípála is said to have written the eulogium but whether on paper at the dictation of Devagaṇa, or on the stone for the engraver, the record makes no mention.

Of the family described, nothing is known for certain. They were probably influential residents of Berar, (ancient Bidarbha,) which was once a large and flourishing kingdom, but of the rulers of which we have now no record. The panegyrist no where assigns to them any royal epithet, and their history therefore can be of no interest to the Indian antiquarian. The inscription, however, is of use as supplying three names in the annals of Chedi, and as suggesting the fact of Nagpur and the country around it, having been, in the year of Samvat 1207 = A. D. 1150 and for a time before it, subject to the princes of Chedi; for it is not likely that the writer of the inscription should select the chiefs of that principality for his eulogium, if he had any sovereign of Nagpur or Bidarbha at the time, to make the theme of his praise. The three princes of Chedi named, are Jájalla, Ratna Pála and Prithví Deva, the last of whom was a contemporary of Govinda, the seventh ancestor of the dedicator of the temple, who lived in A. C. 1150.

*Transcript of an Inscription from Kajraha.*

संवत् १०११ समये ॥ निजकुलधवलौ यो दिव्यमूर्तिः खसीलः (1)  
सम(2)दमगुणयुक्तः सर्वसत्त्वानुकम्पो । खजनजनिततोषोधांगराजेन

\* Govinda; 2, Máme; 3, Ratna Siñha; 4,—? had two wives Jánha and Prathá; 5, Jagut Siñha; 6, Ráyera Siñha; 7, Balha and his brother Devadása alias (?) Devagaṇa.

मान्यः प्रथमर्त जिननाथो यं भव्यपाहिलनामा(3) ॥ १ ॥ पाहिल-  
वाटिका १ चन्द्रवाटिका २(4) लघुचन्द्रवाटिका ३ संकरवाटिका(5)  
४ पञ्चाम्रतलवाटिका(6) ५ आम्रवाटिका ६ धगवाडि(7) पाहिल-  
वंसे(8) तु क्षये क्षीये अपरवंशो(9) यः कोपि तिष्ठति तस्य दासस्य  
दासोयं मम दानंलु(10) पालयेतु(11) ॥ महाराजगुरु स्त्री(12)  
वासवचन्द्र बैसाव(13) सुदि ७ सोमदिने ॥

1. सुमील recte.
2. मम recte.
3. The measure is here broken ; पाहिल should be पाहिल.
4. This figure is not legible in the inscription but there is space for it.
5. The sibilant should be a palatal श.
6. The *m* of *Panchāmra* is doubtful ; it looks more like an *i*.
7. I originally read this word *dhagavāṭikā*, but the last syllable being smudgy, I prefer Major General Cunningham's reading of *Bāḍi*. The *dhaga* is clear, though evidently a miscript of *Dhānga*.
8. वंसे recte.
9. Read वंशो for वंशो.
10. Read लु for लु.
11. Read पालयेतु for पालयेतु.
12. The sibilant should be a palatal.
13. बैसाव recte.

#### TRANSLATION.

In the Samvat era 1011.

Bhabya Pāhila, the ornament of his race, the well-formed, the amiable, he who is possessed of entire controul over his senses and his passions, who is merciful to all created beings and has gratified all his kindred, he who has Jina for his lord, and is the respected of Rājā Dhānga, offers salutations.

Pāhilavāṭikā 1, Chandravāṭikā 2, Laghuchandravāṭikā 3, S'ankara-vāṭikā 4, Panchāmratavāṭikā 5, Amravāṭikā 6, Dhāngavādī, 7. I shall be a slave to the slave of him of any race, who will, on the decease of the Pāhila family, preserve this gift of mine.

Srīvāsavachandra preist of the Mahārājā. In the month of Vaisākha, Monday the 7th of the waxing moon.

*Transcript of an Inscription from Ratanpur, Nagpur.*

[N. B.—Letters within brackets are corrections suggested by the transcriber, those within parentheses are suggestions to fill up blanks]

those that are doubtful have marks of interrogation after them.  
Stars indicate blanks.]

ॐ नमः शिवाय । भोगीन्द्रो नयनश्रुतिः कथमसौ द्रष्टुं [कुं] क्षमो  
नो भवेदेषा चन्द्रकलो 33 syllables missing.

(२) वं शैलसुताप्रबोधनपरो रुद्रो रते पातु वः ॥ १ ॥ सत्सिन्दूर-  
विशालपांशुपटलाभ्यक्षैककुम्भस्थलः सुगढाताडवमण्डिताखिलनभोदि-  
क्खण्डपादप 17 syllables missing.

(३) मीरुहव्यूहोन्मूलनकेजिरस्तु भवतां भूतैरगणयामणीः ॥ २ ॥ देवः  
पीयूषधाराद्रवकरनिकराक्रान्तदिक्चक्रवालस्त्रैलोक्याक्रान्तिनिर्यन्मदन-  
व्यपचमूदप्य[प्य]णभोग \* : । क्षार \* \* \* \* \*

(४) यतिसुरवधूरत्नकर्णावतंसः शुभ्रांशुः प्रौढरामाहृदयगिरिगु-  
हामागसर्व्वकषणीः ॥ ३ ॥ तदंशे भुजदण्डमण्डलमदाक्रान्तत्रिलोकी-  
तलो विभाणः सुरसार्थ[र्व्व]नाथपदवीमुद्दामधैर्यान्नुधिः । स \* \*

(५) निधिमेलनावलयितक्षौ[क्षौ]णीवध्रुवस्तभो भूपातो भुवनैकभू-  
षणमखिर्जाजस्तदेवोऽभवत् ॥ ४ ॥ तस्माच्चदिनरेन्द्रदुर्द्धमचमूचक्रैकवा-  
रानिधेर्त्तात्रौर्व्वज्जलनोऽजनिष्ठतनयः श्रीरत्नदेवोन्मप[प] \* \*

(६) व्यावर्धिःतपोऽडुःगःकुःसुभटस्कारेन्दुविम्बग्रहयासे राडरन-  
न्तसौर्यमहिमास्वर्यो महीमण्डले ॥ ५ ॥ सपर्य्यत्पर्य्यशशाङ्गधामधवलस्ताय-  
द्यशोऽजन्मभूदद्यत्तोत्रतरप्रतापतरणिः सत्तात्रधर्म्माब्धुधिः । ना(ना)

(७) यातदिगन्तवन्दिनिवहाभोद्यार्थचिन्तामणिः पृथ्वीदेवनरेश्वरो  
ऽस्य तनयः श्रीमानभूद्वृतले ॥ ६ ॥ राज्ये भूमिभुजोस्तैव नयमार्गानु-  
सारिणि । क्षीणोपसर्गसंसर्गप्रजानन्दविधायिनि ॥ ७ ॥ वास्तव्यवंश-  
शुभ्रां (शु)

(८) श्रीविन्दस्त्रेदिमण्डलात् । कृतीकाणकमेयासौ देशन्तुर्मागमा-  
गतः ॥ ८ ॥ पुत्रस्तस्य जनाध[न]रागजलधिर्भूद्वत्सभाभूषणो जीयात्य-  
ण्डितपुण्डरीकतरणिर्म्मामेऽभिधानोऽभवत् । यो धात्रीतिजको निजा-  
मल (कु)

(९) लाजङ्गारहारोपमो विख्यातस्त्रिपुरान्तकैकचरणाभोजैकशृङ्गो  
भुवि ॥ ९ ॥ आता श्रीराघवोऽमुष्य कनीयान्गुहसामरः । नागरो  
भुवनाभोगभूषापूषोपमो वभौ ॥ १० ॥ श्रीमामेतनवः समस्त जग-  
तोवि (ली)

(१०) र्शकैक[र्श]स्तरत्नन्देन्दुतिर्कीर्त्तिसन्ततिजसायासकृदिदमः

गडपः। राजत्युन्मदवादिहृन्ददलनो लीलाविहारः श्रियः श्रीलाचारवि-  
वेकपुण्यनिलयः श्रीरत्नसिंहः कविः ॥ ११ ॥ शचीवर्जशोर्गिरिजेव(श)

(११) श्मोर्दुग्धाब्धिपुत्रीवच चक्रपाणेः । साध्वी सदा बन्धुजनाभि  
पूज्या रम्भेति नाम्नाऽभवदस्य पत्नी ॥ १२ ॥ ता[त]स्यामजायत जगत्त्रय-  
घुक्तोर्त्तिराखण्डितारिबुधमण्डलचण्डदर्यः । चण्डोश्चाराचरणाम्बुज-  
चक्षुरीकः प्रज्ञेयः \*

(१२) \* रिहदेवगणस्तनूजः ॥ १३ ॥ एतद्यस्य जगद्यशोभिरभितो-  
डिङ्गीरपिण्डाम्भेराक्रान्तं धवलं विलोक्य निखिलं गोपाङ्गनावीक्षित-  
तः । कालिन्दीऋदकालनेमिदलनप्रारम्भवीतादरस्तीरे ताम्यति वा-  
रिराशितनया \*

(१३) जोऽपिजातभ्रमः ॥ १४ ॥ पीयूषव्रवसान्द्रविन्दुवसतिर्यस्यास्य  
वाक्चन्द्रिका विद्वद्वक्त्रचकोरचक्षुपुटकैरापीड्यमानानिष्टम् । किञ्चाय  
[यं] करपद्मरोखिलमिलन्नानादिगन्तार्थिनां । भूयो भीष्टफलप्रदान-  
चतुरश्चाधीश (क)

(१४) ल्यङ्गमः ॥ १५ ॥ चन्द्रिकेव शिशिरांशुमालिनो मञ्जरीव  
सुरमेदिनीरुहः । कान्तिनिर्जितसुराङ्गनागणा तस्य साधुचरिता  
वधूः प्रथा ॥ १६ ॥ जान्तेनाम्नी द्वितीयास्य विलासवसतिः प्रिया ।  
अमृतप्रेमवाञ्छल्याद्भि (ती)

(१५) यं प्राणमन्दिरम् ॥ १७ ॥ लावण्याप्रतिमसुखतामदभरामौ-  
लीन्दुना काधतो दग्धस्यापि मनीभवस्य भुवने विद्येव सङ्गीवनी । स-  
त्सौभाग्यगुणैकगर्व्ववसतिः प्राणाधिका प्रेयसी यां निर्मायसरोजभूः  
प्रमुदि (तः)

(१६) प्राप्तः परां निवृ[र्त्त]तिम् ॥ १८ ॥ अवोधध्वान्तसन्तानकवि  
[रि]कुम्भविदारणः । जगत्सिंहोस्य तनयः सिंहवद्भुवि राजते ॥ १९ ॥  
तारकारिरसौ शैलसुतासूनुयं पुनः । सुतोरायरसिंहोऽस्यै बन्धुवर्गस्य  
तारकः ॥ २० ॥

(१७) भोपास्य दुहिता साध्वी कलिकालविचेष्टितैः । अस्पृष्टा  
स्वर्धुनीवेयं भुवनत्रयपावनी ॥ २१ ॥ बाह्यश्रीदेवदासाख्यौ बद्धस-  
ख्यौ परस्परम् । जगदुद्योतकौ भातः पुण्यवन्ताविवाम्बरे ॥ २२ ॥ वा-  
तोद्भूत (वि)

(१८) लोलतूलतरुं नृणामिदं जीवितं लक्ष्मीं घोरघनान्तराल  
विजलद्विद्युद्विजासोपमाम् । मत्त्वैतदुरितौघदायदहनप्रोहामदावा-  
अङ्गामुद्धतधर्मबुद्धिरकरोज्ज्वलः पथे साम्बते ॥ २३ ॥ चक्रदेव \*

(१६) यो धाम विस्वपाणिपिनाकिनः । सांवाग्रामे तुषाराद्रिसि  
[शि]खराभोगभासुरम ॥ २४ ॥ नानाभूपालभुक्तक्षितिजघनघनाश्लेष-  
तोषादिवादै दिग्वासाकामपीडातरलतनुगुरुश्लेषलिप्तं समन्ता (त्)

(२०) कामीवेदम्बिदग्धो विरचितपरमप्रेमहासंत्वरवत्स्वर्वाभासां  
समक्षं गगनपरिसरश्रीमुखं चुम्बतीव ॥ २५ ॥ निःशेषागमशुद्ध-  
बोधविभवः कायेषु यो भव्यधीः सत्तर्काम्बुधिपारगो भृगुसु (तो)

(२१) यो ? दण्डनीतौ मतः । छन्दोलङ्घृतिशब्दमन्मथकलाशाखाङ्गच-  
ण्डद्युतिश्चक्रे देवगुणः प्रशस्तिममला[ला] श्रीरत्नसिंहात्मजः ॥ २६ ॥  
यः कायकैरवविकाशनशीतराशिरुहामबद्धिनिलयोऽव

(२२) (नि) पालसूनुः । विद्याविंशासवसतिर्विमलां प्रशस्तिं  
श्रीमानिमां कुमरपालबुधो लिलेख ॥ २७ ॥ प्रशस्तिरियमुत्कीर्णा  
रचिराक्षरपंक्तिभिः । धीमता सूत्रधारेण सांपुलेन मनोरमा ॥ २८ ॥

(२३) \* \* \* वगणावेतौ रूपकारशिरोमणी । चक्रतुर्घटनां घासो-  
विस्वपाणिपिनाकिनः ॥ २९ ॥ चन्द्रार्कौ किरणावलोवल्यितं याव-  
द्विधत्ताम्लगदिङ्मातङ्गघटोपहंसितधरा चक्रक्षेज्व ? \*

(२४) \* \* \* कत्रप्रकरोरुहारलतिकाऽलङ्कारसारं नभस्वल्की-  
र्त्तिर्मदनारिमन्दिरमिषातावाचिरं नन्दतु । ३० ॥ सम्बत् १२०७ ।

### Translation.

1. *Om*; salutation to S'iva. The king of snakes hears by his eyes; how can he fail to see the moon \* \* \* \* \* May Rudra, thus awakening the daughter of Salya for dalliance, protect you. \* \* \*

2. With his frontal globes besmeared with a profusion of powdered pure red-lead, and his pliant trunk covering all space with its dances† \* \* \* \* \* May the great among the Ganas prove propitiations to you !

3. The god whose nectar, flowing from his numerous arms, covers all space, and whereupon the army‡ of Eros (Madana) sallies forth \* \* \* \* the moon which is like a jewelled ear-ring of the ladies of

\* The stanza is incomplete and therefore the connection of the sleeping goddess with the visual organ of snakes which is supposed by the Purānics to be the seat of their hearing, cannot be ascertained.

† An allusion to the elephantine head of Ganes'a. The stanza is incomplete.

‡ The *bhranara*, a large black bee noted for its sweet murmuring hum, and supposed, from its appearance in the commencement of spring, to heighten the pangs of separation in love-sick maidens.



heaven, which expels from the inmost recesses of the hearts of mature females the feeling of anger against their lovers\* \* \* \* \*

4. In his race was born king Jájalla Deva, an immeasurable ocean of patience, the only great jewel that ever decorated the brow of this sublunary sphere. The might of his wand pervaded the three worlds. He assumed the title of the lord of the Súrās, and became the favorite of his mistress the sea girt earth.

5. From that mighty sovereign of Chedi, who with his invincible army was like unto an ocean, proceeded Sri Ratnapála his son, who was fierce as the submarine fire Bádavánala† \* \* \* \* \* a Rahu‡ to eclipse the moon-like countenance of heroes—a wonder on the face of the earth for endless might and glory.

6. He is the birth-place of expansive renown. Radiant as the hoary orb of the full moon—a rising sun of unbounded majesty—an ocean of Kshetria virtues—he is an all-yielding gem§ to the bards who flock (round him) from all quarters. Unto him was born Prithudeva the lord of mankind.

7. When the dominion of this sovereign was ruled according to the principles of polity, when approach of evil portents had been minimised, and the people lived in peace,

8. There came in the fulness of time to the Turmána country from the regions of Chedi, Govinda the pious (or active?) of the race of Vástavya, pure as the moon.

9. Unto him was born a son of the name of Máme. He was an ocean of philanthropy, an ornament for the decoration of royal courts, a sun to the lotus of wise men.|| May he live long in prosperity! He was the pride of his nurse and a garland to his pure race. The renowned, the only bee extant on the lotus feet of the destroyer of regions (Siva and—)

\* The princes named in this inscription evidently belonged to the lunar race, but owing to a hiatus in this stanza, the name of the particular branch of that race from which they descended, cannot be made out.

† Nine letters at the beginning of the second half of the stanza are unintelligible.

‡ “The ascending node; in mythology, the son of Sinhika a Daitya, with the tail of a dragon, whose head was severed from his body by Vishnu, but being immortal, the head and tail retained their separate existences, and being transferred to the stellar sphere, became the authors of eclipses; the first especially by endeavouring at various times to swallow the sun and moon.” Wilson.

§ *Chintámāni* a fabulous gem, the possession of which is supposed to yield its possessor whatever may be desired.

I. e. as gratifying is the sun to the lotus so is he to wise men.

10. His younger brother Sri Rághava was a prodigy of merit. Gallant (in his bearing,) an ornament of creation like the sun (Pusha).

11. The son of Sri Máme was the poet Sri Ratna Siñha. The arms\* of his mighty deeds, spread, scattered and refulgent everywhere, white as the light of the Kunda† flower or the moon, have enveloped the earth. He flourishes, the trampler of his excited opponents, the pleasure ground of fortune, the receptacle of urbanity, good conduct, wisdom and virtue!

12. The name of his wife was Rambhá. Chaste and adored by her friends, she was to her husband what Sachí‡ is to Indra, the mountain-born Girijá to Sambhu,§ or the daughter of the ocean to the wielder of the discus.||

13. She bore a son renowned in all the three regions of the universe, who had eclipsed the high pride of his enemies, as well as of the learned, and was like unto a bee at the beautiful lotus-feet of Chandí and Isa.¶

14. The earth around was enveloped by his fair fame bright as the foam of the sea. Milk-maids observing that wide-spread whiteness and mistaking it for the churning of the Kalindí with the serpent Kálaneimi.\* \* \* \* \*

15. Clustering drops of melted nectar dwelt in his speech, which was as charming as the moon, and the mouth of the learned, like the beak of the Chakora,† pecked at them without intermission. His hands were the cage in which dwelt, (birdlike,) the beggars who crowded around him from various quarters. He was a royal‡ tree of desire,§ which was well fitted to gratify this desire in profusion.

16. His wife was the well-behaved Prathá, whose beauty had overshadowed the charm of goddesses. She was like unto the light of

\* Lit. The creeper *latf*.

† *Jasminum pubescens*, Willd. *J. hirsutum*, Linn.

‡ Wife of Indra.

§ Durgá, daughter of the Himálaya mountain and wife of S'iva.

|| Lakshmi produced by the churning of the ocean, and Vishnu whose chief weapon is a discus.

¶ Durgá and Mahádeva.

\* The last part is unintelligible. Kálinidí is the river Jumna, so called on account of her blue waters.

† A bird unknown to modern ornithology, but supposed by Indian poets to hover around the moon and live upon the nectar that exudes from the orb of that luminary. The word is also used to indicate the *Tetrax rufus vel Perdix*.

‡ *Adhisa* in the original; the epithet is of doubtful application.

§ *Kalpadruma* a fabled tree which yields whatever may be sought of it.

the orb of soothing rays,\* or the blossom of the favourite tree† of the gods.

17. His second object of enjoyment was the favourite Jáhno. From exuberance of love, (he had made her) a second abode for his life.

18. In loveliness she was an ivy‡ without compare. Proud as being the elixir which restored the life of him (Hindu Eros) who had been consumed by the anger of Siva, she was the boastful residence of all fortunate qualities. Dearer than life was she, the lovely. Brahmá, having designed her, felt satisfied, and gave up all farther desire for creation.

19. His son was Jagatsiñha, who lived on the earth like a lion, to break the frontal orbs of the elephant of ignorance.

20. (As such) he was like the son of Salyasutá and the enemy of Táraka.§ His son was Ráyera Siñha a defender of his friends.

21. His daughter was Bhopá, chaste, bereft of the vices of the Kaliyuga, and like the heavenly river Ganges, a purifier of the world.

22. Bálha and Devadása|| were united together by the ties of friendship, and as radiant on earth as are the virtuous in heaven.

23. Life is unstable as cotton fleece before a breath of wind, and fortune is to be compared to the play of lightning between masses of heavy clouds. Knowing this, that virtuous man turned his attention to that eternal and benign path, which is like unto a blazing fire to the forest of sins.

24. In the village of Sám-bá, (or at Sám-bágráma,) Deva—na dedicated to the holder of the Bilva¶ and the dread trident Pináka, (S'iva) a temple bright as the brow of a cloud-capped mountain.

25. The temple, as if excited by the deep embrace of the earth, the abode of many kings, and bent on continuous dalliance with the nymphs of the quarters, seemed, like a love-stricken swain, to kiss the charming face of heaven in the presence of celestial damsels.

\* The moon.

† Párijata, like the *kalpadruma*, a mythical creation. It is typified as a tree of extreme beauty and its flowers are supposed to possess the most exquisite fragrance.

‡ Lit. a creeper.

§ Kártikaya god of war, son of Siva and Durgá, called Tárakárí from having killed a giant named Táraka.

|| These two were probably sons of Ráyara Siñha. The latter evidently is the same with the Deva-na of the 22nd stanza, but not the poet Devaguna named in the 26th stanza as that would make the geneology uncalled for. to the loss of a syllable, the name cannot be made out, the letters alone exist.

¶ *Ægle marmelos*, the favorite tree of S'iva.

26. Devaguna, son of Śrī Ratna Siṅha, whose wealth consisted of the pure knowledge of the Śāstras, whose genius in poetry was vast, who was proficient in logic and renowned for versification, rhetoric, lexicography, the art of love, and other branches of learning, who was like the son of Bhṛigu, (Ś'ukra,) in the administration of the criminal law, even he composed this chaste eulogium.

27. He who was like unto the moon in developing the lily\* of poetry, he who was the store-house of intelligence, and the pleasure-ground of learning,—even he, the auspicious Kumarapāla, son of Avapipāla, wrote this chaste eulogium.

28. And the charming composition was engraved in beautiful letters and lines, by the intelligent carpenter (stone-cutter?)† Sampula.

29. \* \* \* \* Vagana, the two great manifestoes of forms, erected this temple of Pinākī, the holder of the Bilva.

30. As long as the sun and the moon will hold the earth enveloped in their beams \* \* \* \* as long as the elephant, of the quarters will—\* \* \* \* and the heaven will be embellished with—\* \* \* \* so long and for ever shall the memory of his deeds last under pretence of this temple to the enemy of Cupid‡—Samvat 1207.

\* The Kumuda a lily that opens at night.

† Sutrādhāra in Sanskrita, from which comes the modern Bengali word, *chhutār* a carpenter. According to the dictionaries it is never used to imply a lapidary, an engraver or a sculptor, those being indicated by the terms *manikāra*, *takshaka* or *Mudrākāra* and *Bhāshkara* respectively.

‡ Verses 1st, 2nd, 4th, 5th, 6th, 9th, 11th, 18th, 23rd, 26th, and 30th, are in the Sārdulavikṛīḍita measure, which reckons 19 syllables to the foot with a cæsura after the 12th, the long and short syllables being arranged thus — — — — —

The 7th, 8th, 10th, 17th, 19th, 20th, 21st, 22nd, 24th, 28th and 29th are in the well known octosyllabic anustubh.

Five verses, viz. the 13th, 14th, 15th and 27th are in the Vasantatilaka, a measure of 14 syllables to the foot, with a cæsura at the 8th, thus :

The 3rd verse is in the Sragdharā of 21 syllables, with a cæsura at every seventh syllable, thus — — — — — ; the 12th in the Indravajra of 11 syllables, — — — — — ; the 16th in the Rathoddhatā of 11 syllables, thus — — — — — , and the 25th in the measure of the Meghaduta, the mandikrāntā, thus, — — — — —

PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,  
FOR MAY, 1863.

The monthly general meeting of the Asiatic Society of Bengal was held on the 6th instant.

E. C. Bayley, Esq., in the chair.

The proceedings of the last meeting were read, and the chairman having put the question that they be confirmed, Mr. Oldham moved that the paragraph commencing, "The motion was opposed" so far as the words "due notice given" be omitted.

The chairman stated that the note quoted in Mr. Grote's amendment had been advisedly omitted from the record of the proceedings, as being explanatory only, but that it could be inserted if the meeting thought it expedient.

Mr. Oldham's motion having been put to the vote, was lost, and the record of the proceedings, with the addition of the note referred to, was then confirmed; Mr. Oldham then handed in a protest on the ground that the record was in his opinion "incorrect, partial, and unfair."

Presentations were received—

1. From the National Hungarian Museum, a collection of fishes, reptiles, birds and mammals.

2. From A. G. Macdonald, Esq., through Mr. J. D. Gordon, a skull and teeth of *Rhinoceros Indicus*.

3. From Lieutenant-Colonel E. T. Dalton, several crania from Ranchee, in Chota-Nagpore.

From Baboo Giridharee Lal, some supposed fossils from Raj-

5. From Colonel Phayre, four inscribed tiles with Buddhist figures, found at Pagan.

6. From the Literary and Philosophical Society of Manchester, several publications of the Society.

7. From the Right Hon'ble the Secretary of State for War, through the Superintendent of the Ordnance Survey, a copy of the Meteorological Observations, taken at the Stations of the Royal Engineers, during 1853-59.

8. From the Under-Secretary, Government of India, Foreign Department, a copy of a report on the Island of Mahi, the largest of the Seychelle group, by Lieutenant-Colonel L. Pelly.

The following correspondence between the Council and a Committee of gentlemen at Lahore who had associated themselves for the furtherance of the objects of the Society, was submitted for the information of the meeting :—

TO THE SECRETARY TO THE ASIATIC SOCIETY OF BENGAL.

*Dated Lahore, January, 1863.*

SIR,—I have the honor to forward, herewith, copy of the proceedings of a meeting held at Lahore on the 27th instant for the purpose of devising some plan for collecting information concerning the antiquities, ethnology, physical statistics, &c. of the Punjab and adjoining countries.

2. The Committee are anxious to co-operate, if possible, with your Society, and would feel obliged if you would intimate whether their proposal is acceptable, and in the event of its being so, will be thankful for their suggestions and guidance in the matter.

3. The first object of the Committee will be to collect, in a compact shape, all the information upon the above mentioned subjects which already exists scattered through the pages of local reports, magazines, and scientific journals.

4. Their next object will be to collect further information from local officers and other persons taking an interest in these subjects.

5. The Committee believe that, being placed, as they are, at the seat of the local Government, and having access to the Government records, they are favorably situated for carrying out both these objects ; at the same time they would wish it to be clearly understood that they have no intention to trespass upon the field already occupied

by the Asiatic Society of Bengal, but are simply desirous of aiding, by an organized effort, the promotion of the objects of the Society.

I have &c.,

(Sd.) T. H. THORNTON,

*Secretary to the Provincial Committee.*

“Proceedings of a meeting held on 27th January, 1863, with a view of devising some plan for collecting information regarding the antiquities, ethnology, climatology, arts, manufactures, &c., of the Punjab and adjoining countries.

“Present:—Lieutenant-Colonel Maclagan, Secretary to Government, Department of Public Works; R. H. Davies, Esq., Secretary to Government; Dr. Cleghorn, Conservator of Forests, Madras, (on deputation to the Punjab); T. H. Thornton, D. C. L., Judge of Small Cause Court, and Curator of the Lahore Museum.

“Unavoidably absent.—T. D. Forsyth, Esq., C. B.; Commissioner of Lahore Division; D. F. McLeod, Esq., C. B., First Commissioner, Punjab; R. N. Cust, Esq., Judicial Commissioner of the Punjab.

“Lieutenant-Colonel Maclagan having consented to preside, and Mr. T. H. Thornton to act as Secretary.

“It was resolved—

1. “That communication be opened with all Commissioners and Deputy Commissioners and Assistants in independent charge, writing to them to co-operate, and also with the following gentlemen:—

Rev. Isidore Loewenthal, (Missionary, Peshawur); Rev. H. A. Jaesche (Missionary, Kotgurh,) and Mr. Drew (Kashmir).

2. “That the following gentlemen be asked to be members of the Committee:—R. Stevens, Esq.; Dr. Brown; Dr. Neil, and Pundit Munphool.

3. “That Mr. Davies be requested to prepare a memorandum of the existing information regarding the tribes, &c. inhabiting the Punjab and adjoining countries.

4. “That Lieutenant-Colonel Maclagan be requested to prepare a similar memorandum regarding the arts and manufactures.

5. “That Dr. Cleghorn be requested to afford his aid in the same manner, regarding the fauna and flora of the Punjab.

6. “That Mr. T. H. Thornton be requested to prepare from local sources, and other memoranda, a list of objects of historical and

antiquarian interest, concerning which further information is desirable.

7. "That a copy of the proceedings be forwarded to the Secretary of the Asiatic Society of Bengal, with an intimation that it is the desire of this Provincial Committee to co-operate with the Asiatic Society in the manner above indicated, or in any other way by which the objects of the above Society may be promoted, and that they will feel obliged by the Society's guidance in the matter."

FROM THE SECRETARY TO THE ASIATIC SOCIETY OF BENGAL,  
TO T. H. THORNTON, ESQ.,

*Secy. to the Provincial Committee, Lahore,  
Asiatic Society's Rooms, Calcutta, 9th March, 1863.*

SIR,—Your letter, dated January 1863, with its enclosures, having been taken into consideration by the Council of the Asiatic Society, I am directed to express the great gratification with which they have received the announcement of the influential movement at Lahore in furtherance of the objects to which the operations of this Society have always been directed. The Council feel that concentrated local efforts, to promote these objects, cannot fail to be of great advantage as well to the Society itself as to the general interests of literature and science, and they believe that such efforts will be especially valuable in the Punjab, where the field of enquiry is of more than ordinary interest, and gives promise of a rich and abundant harvest. They, therefore, desire me to respond most cordially to the offer of co-operation which has been made to them by the Lahore Committee, and to intimate that they are prepared to assist in carrying out the objects proposed to the utmost extent of the means at their disposal.

But before suggesting any definite arrangements for mutual assistance, the Council desire to be informed what are the precise wishes and intentions of your Committee as to its own constitution and the publication of its proceedings and researches; whether it is proposed that the Committee should be constituted as a separate body corresponding with, but independent of, this Society, and publishing its own records, or whether its object is rather to work as a Local Committee of this Society, contributing its papers for publication in the Society's Journal.

The Council would gather from your letter and from the resolutions of the Committee that the latter course is the one contemplated.



ed, but they are unwilling to assume that this is the case without a definite assurance that they have not misinterpreted the Committee's views.

At the same time, I am to say that the Council are generally of opinion that the association at Lahore will be most permanently useful by co-operating as a local Committee with the Society. It has been found that all attempts hitherto made to maintain independent societies in the interior of the country have invariably failed, and the Council believe that the time has not yet arrived when similar attempts are likely to be attended with more than temporary success.

The Council will be glad to be put in possession of your Committee's view on this point, and receive any suggestions that may occur to you regarding the mode in which communication should be conducted, and they will then endeavour to make such arrangements as will meet your wishes and be most conducive to the success of the object of the Committee and this Society.

I have, &c.,  
(Sd.) W. S. ATKINSON,  
*Secretary. Asiatic Society of Bengal.*

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FROM T. H. THORNTON, ESQ., D. C. L.,  
*Secretary, Lahore Committee.*

TO THE SECRETARY TO THE ASIATIC SOCIETY OF BENGAL.

*Dated, Lahore, the 21st April, 1863.*

Sir,—Your letter of the 9th March last has been laid before the Lahore Committee, whose meeting was somewhat delayed owing to the absence of some of the principal members from Lahore, and I am directed to reply as follows to the inquiries made regarding the “precise wishes and intentions of the Committee as to its constitution, and the publication of its proceedings and researches.”

2. The latter portion of your second paragraph correctly describes what the desire of the Committee is, viz., to be a Local Committee of the Asiatic Society, contributing its papers for publication in the Society's Journal.

3. They would prefer this to attempting to establish an independent Society, for the reason you mention; for in a Society like that at Lahore, composed chiefly of Government officials and other persons

liable to removal, it is impossible to ensure a continued active interest in the department of literature taken up by the Asiatic Society of Bengal. They are of opinion that as a Local Committee of your Society, as much might be done by them for forwarding the objects they have in contemplation, as if they were an independent body ; while on the other hand, the duties being less onerous, the fear of failure is less. They would wish, therefore, to be styled,—should the appellation meet with the approval of your Society—"The Punjab Local Committee of the Asiatic Society of Bengal."

4. Of the present members of the Committee,\* the majority are already members of your Society, and I

\* PRESIDENT.

Lieut.-Colonel Maclagan.

*Members.*

D. F. Macleod, Esq., C. B.

R. N. Cust, Esq.

R. H. Davies, Esq.

T. D. Forsyth, Esq., C. B.

R. E. Egerton, Esq.

Dr. Cleghorn.

Dr. B. Brown.

Capt. Stubbs, R. A.

Dr. Neil.

T. H. Thornton, Esq., D.C.L.

C. A. D. Gordon, Esq.

myself, though not a member, am anxious to become one, but I presume that the fact that all the members of the Committee are not members of the Asiatic Society will not be considered an objection to their recognition as a Local Committee of your Society. Should such be the case, perhaps the appellation "Punjab Auxiliary Committee to the Asiatic Society"

would meet with your approval.

5. Having thus described the position the Committee would wish to assume in relation to your Society, I have now the honor to intimate the views of the Committee regarding their future proceedings.

6. Their first object will be to collect together in a compact shape, from scientific journals and local reports, all the existing information regarding the antiquities, ethnology, arts, and physical statistics of this Province.

As regards ethnology, the task has been undertaken by Mr. Davies, Secretary to the Government, but as that gentleman has suddenly left for England on six months' leave, Mr. Cust has kindly taken it off his hands for the present.

The subject of arts has been entrusted to Lieut.-Col. Maclagan ; that of flora to Dr. Cleghorn ; meteorology to Dr. Neil ; numismatics to Capt. Stubbs, and archæology and history to the Secretary.

7. This being done, they propose to issue from time to time lists of *desiderata* to the local officers of the Provinces, and to others interested in these subjects, from whom they have already received

assurances of support; and they have already issued one general circular, a copy of which is annexed, for furnishing periodical lists, such as I have described. Any assistance or suggestions from your Society would be gratefully received.

8. They would further propose that any written contributions of importance which they may receive be forwarded in *extenso* for publication at your Society's discretion, in the Asiatic Society's Journal, and that from time to time a *resumé* of information obtained and of the proceedings of the Committee generally, should be furnished by the Secretary.

9. With regard to any coins or other antiquarian remains of interest which may be contributed, the Committee would reserve a discretion of depositing them in the local Museum of Lahore, if they think fit.

10. I may add that the Punjab Government has evinced a great interest in the Committee, and has intimated its desire to aid its operations in every way it can; and that the Committee hope that, by their own exertions, aided by the countenance and assistance of your Society, they may be able to be of some use in collecting information of value and stimulating further research in a region abounding with objects of historical, ethnological, and physical interest.

I have, &c.,

(Sd.) T. H. THORNTON,

*Secy. to the Lahore Committee.*

The chairman intimated that further information would be communicated when the correspondence was complete.

The nomination of the Hon'ble H. S. Maine to be a member of the Council, vice the Hon'ble C. J. Erskine was confirmed.

The Council reported that on the recommendation of the Natural History Committee they had raised the salary of Mr. J. Swaries, taxidermist, at the rate of 4 annas for every working day.

A letter from Rev. T. H. Burn intimating his desire to withdraw from the Society was recorded.

The following gentlemen, duly proposed at the last meeting were balloted for and elected ordinary members :—

Lieutenant H. R. Thuillier; H. D. Robertson, Esq., C. S.; P. W. Wall, Esq.; W. H. Stevens, Esq.; Dr. J. Tyler; Hon'ble E. P. [redacted]nge, and W. Edgar, Esq., B. C. S.

The following gentlemen were named for ballot as ordinary members at the next meeting :—

W. Clementson, Esq., Executive Engineer, Bassein, proposed by Mr. Theobald, and seconded by Mr. Atkinson.

Colonel Hamilton, Commissioner of Delhi, proposed by Mr. Cooper, and seconded by Mr. Grote.

Captain G. C. Depree, Royal Artillery, proposed by Lieutenant-Colonel Dalton and seconded by Mr. Atkinson

T. D. Forsyth, Esq., C. B., Commissioner of Lahore, proposed by Colonel Maclagan, and seconded by the President.

Baboo Chundersekur Roy, of Julpigorie, proposed by Baboo Rajendra Lal Mitra, and seconded by Mr. Grote.

T. H. Thornton, Esq., C. S., proposed by Mr. Bayley, and seconded by Mr. Grote.

Hon'ble G. Campbell, proposed by Mr. E. C. Bayley and seconded by Mr. Grote.

Mr. Oldham gave notice that he would move at the next meeting—

1. That he would call the attention of the Society to the careless and discreditable manner in which the Journal of the Society is at present conducted, as calculated to reflect very serious disgrace on the Society ; and to the unreasonable delays which occur in the issue of the several numbers, by which much of their contents is rendered obsolete and comparatively useless.


2. That inasmuch as no improvement in the Museum of the Society is visible, the Council be requested to state in detail the steps which have been taken for the proper disposal of the sum of Rs. 200 per mensem granted by the Government for the improvement and support of the Natural History Museum of the Society, which sum the Society has received since April, 1862.

Captain Lees gave notice that at the same meeting he would move—

That Bye-Law 77 of the Society be amended as follows :—

The Council shall elect from their own body Sub-committees or sections of Oriental literature, Natural History, &c., also a Sub-committee of Finance, whose reports on all matters referred to them shall be submitted to the Council.

Communications were received—

1. From the Secretary, Government of India, Public Works 

partment, a copy of a letter from Major General Cunningham, forwarding his daily report of occupations for February last.

2. From the Under Secretary, Government of India, Public Works Department, a printed copy of a memo. by Major General Cunningham, regarding the life-size statues recently discovered inside the Delhi palace, together with a copy of the report of his occupations in January last.

Mr. Bayley read the memorandum as follows :—

“ 1. On the information furnished to me by Mr. Cooper, Deputy Commissioner of Delhi, I went to the palace to inspect the fragments of two human statues in red stone, and of two statues of elephants in black stone, which had lately been found in clearing away some old building inside the area of the palace walls.

“ 2. The two human statues which are of life-size are formed of single blocks of the well-known reddish chocolate-coloured sandstone of Futtehpore Sikri. One of the heads is missing, and the other is separated from the statue, having been broken at the neck. The head-dress is that of a royal personage, such as is seen in the pictures of the kings of Delhi, and such as is now worn by all Rajput princes. But the figure is certainly that of a Hindu, as the dress is represented with its opening over the right breast. Both figures are squatted in the native fashion. They were probably coloured originally to represent the real figures, as the spots of the stone are not visible anywhere on the surface, but only at the points of fracture.

“ 3. The elephant statues are each formed of many pieces of hard black stone, which were originally built up with thick square bars of wood inside the legs, the pieces being joined together by fine lac. One forefoot measures six feet five inches in girth, and another measures six feet two inches. If the height accorded with the well-known proportion of twice the girth of the forefoot, these statues would have been colossal, or not less than twelve feet ; but I believe that the legs of these figures, as is usual in all Indian statues of elephants, were made somewhat stouter than nature, to obtain actual stability, as well as to give an appearance of sufficient strength. The number of pieces of these statues is very great, and many of them are much injured ; but I think that one complete statue, or very nearly complete, might be built up with a little care and trouble. I recognised the following pieces :—

"1st.—Top of head to below the eyes, in two pieces, which were joined perpendicularly.

"2nd.—End of the trunk; holding a chain and resting on the ground.

"3rd.—Two ears, each three feet long.

"4th.—Piece of back, towards the tail.

"5th.—Piece of stomach, hinder portion.

"6th.—Several pieces of a howdah. The chains (which no doubt supported bells) are formed of yellow stone let into the black stone of the howdah; similarly, the cotton ropes which fastened the howdah, are formed of white marble.

"7th.—There are also several pieces with straight-lined ornamentation in white and yellow stone, let into the black stone, which, I presume, must have represented the decorated borders of the *jhal* or cloth trapping, which is usually embroidered in gold and silver.

"8th.—A doubtful piece with a deep round socket. This may, I think, have been part of the jaw for the insertion of a tusk, which would, of course, have been made of white marble.

"4. From this brief account it is evident that, in these broken statues of men and elephants, we possess something quite unique in Indian sculpture. The human figures are of life-size, and although the legs of the elephants are rather massive, I believe that their statues were also of the usual height. Small statues of elephants are not uncommon, and may be seen in many Indian temples; but with one single exception, I am not aware that the Hindu artists have ever attempted so large a piece of sculpture as a full-size figure of an elephant. The exception which I refer to was the great elephant statue which once stood on a pedestal outside of the upper gate of the fort of Gwalior, which was accordingly called Hathiya-Paur or Elephant Gate—a name which it still bears, although the statue has long ago disappeared. This statue was of life-size, and bore on its back three human figures—namely, Raja Man Singh of Gwalior, with his *mahout*, and his attendant umbrella-bearer. Raja Man Singh died during the siege of Gwalior by Ibrahim Lodi in A. D. 1518. The group was soon afterwards seen by the Emperor Babur, who describes it fully in his memoirs. It is afterwards noticed by Abul Fazl in his *Ayin Akbari*, written in the 40th year of Akbar's reign, and it is last noticed by an English merchant who visited the fort of Gwalior.

the reign of Shah Jehan. That it was removed during the reign of his son and successor, the bigoted Aurungzebe, I have little doubt, as it is omitted in his minute account of Gwalior by Hiranman, a Hindu Moonshee in the employ of Aurungzebe's Mahomedan governor of the fortress.

"5. Now it seems to me possible that the statues just discovered in Delhi may have been brought from Gwalior, for tradition says that there was formerly a second life-size elephant in the Gujar Mahal, at the foot of the fort of Gwalior. That it was usual to remove such objects to Delhi, we have a proof in the case of the brass statue of a bull which was obtained by Ibrahim Lodi on his capture of the Badilgarh outwork of the fort of Gwalior. This brazen statue, according to Ferishta, was carried to Delhi and thrown down before the Bagdad gate of the city.

"6. I know of only one objection to this identification of the Delhi statues with Man Singh's missing group from Gwalior—namely, the probability that all the statues would have been formed of the durable light-coloured sandstone of Gwalior. But as a black stone was selected for the elephants, it seems probable that the designer may have purposely made use of the reddish brown sandstone of Futtéhpore Sikri for the human figures, for the special purpose of giving the group as nearly as possible the actual colours of real life. This idea is further carried out in the white and yellow marbles of the ropes and chains. It is only a surmise, however, that the Delhi figures may possibly be the very group that once adorned the upper gate of the fortress of Gwalior. Perhaps some one of the three authorities whom I have quoted as making mention of the statue, may have noticed some peculiarity of colour that may settle this point. I have no means of reference at present in camp, and am writing from memory, as I have only a few books with me.

"7.—But whether these Delhi statues be identical with the Gwalior group or not, their value as unique specimens of Indian sculpture is undoubted. I would therefore most earnestly recommend that immediate steps should be taken for their preservation and that an attempt at least should be made to reconstruct one of the elephant statues. If one statue should be found complete, or nearly so, it should, of course, be preserved: but even if the fragments should be insufficient for one statue, I think that an attempt might still

be made to complete it with the aid of brick and mortar coloured black, if only for the purpose of having the group photographed.

"8.—Perhaps Lieut. Macsween, of the Engineers, would be able to set up one of these statues at a small expense, say of Rs. 50, in about one fortnight.

(Sd.) "A. CUNNINGHAM, *Major General,*  
*"Archæological Surveyor to the Govt. of India.*

3. From Baboo Gopeenath Sen; Abstract of the Meteorological Observations taken at the Surveyor General's Office, Calcutta, in February last.

4. From Mr. W. Theobald, Jr., the following note on the phenomenon known as Ignis-fatuus, or Will-o'-the wisp:—

"MY DEAR ATKINSON,—I wish through the pages of the Society's Journal to direct the attention of observers interested in the enquiry, to that curious, and, I believe, hitherto unsatisfactorily explained phenomenon "Ignis-fatuus" or "Will-o'-the-wisp," and to record a curious belief current in Burmah respecting it:—I am aware that a certain class of reasoners have ventured to throw doubts on the very existence of the phenomenon in question and have sarcastically suggested that three conditions are requisite to insure its reported development—that the ground must be 'boggy,' the atmosphere 'foggy' and the philosophic observer decidedly 'groggy,' at the time; but having been myself a frequent eye-witness where only the two first conditions were more or less realised, I must dissent from this somewhat less charitable than ingenious theory. The European superstition of the 'Elfish' origin of Ignis-fatuus is well known, and in Hindustan the belief is prevalent that the light is borne by a ghost. The Burmese belief is very curious and recalls some mediæval European superstitions of like character, and if it proves nothing more, the existence in three distinct regions of a different belief, as explanatory of a certain phenomenon, goes far to prove the reality and non-imaginary character of the appearance in question.

"In Burmah it is believed that there is a class of wizards whose heads become dissociated from their bodies during the night and wander about the jungle feeding on carrion, the bodies remaining at home, and the Ignis-fatuus is supposed to proceed from the mouth of one of the wandering heads. If a head is secured whilst ab-



loudly claims to be released, and if detained more than twelve hours from rejoining its body, both head and body perish, and it is believed that such heads have often been captured, though I need hardly add, none of my informants had themselves seen one. This superstition calls to mind the one formerly current in Europe that the body of a witch might remain at home, or its semblance, whilst the spirit was at its evil practices abroad; hence the inutility of an *alibi* for the wretched beings accused of witchcraft. In India, *Ignis-fatuus* is commonly known by the name of *Bhutni*. It usually occurs near villages and usually about tanks, or marshy spots, flat malarious country. The phenomenon is very common around the Rajmahal hills, on the flat alluvium near the hills, and the best instance I ever witnessed was near one of the bungalows built by the late M. Pontet near where the railway passes, but the exact name I have forgotten. It was a cold night in January (I think) when, about nine o'clock, I was called by my servant in accordance with previous direction of mine, and told that 'many *Bhutnis*' had come out. Sure enough several lights were visible moving about a little, but usually not far from one spot. I think I must have watched one at some 300 yards for a quarter of an hour, and can only describe it without suggesting an explanation, save that it may have possibly originated with some luminous insects collected together. The light had all the appearance of an ordinary *mussal* or oil torch, and appeared fully as large and as bright. It had the appearance of emanating from some slowly consuming body with the evolution of phosphorescent fumes, but this might be merely the effect of a vivid light on the dense cloudy stratum of fog at that particular spot. The night was still, but an occasional puff of air would alter the position of the light; which, however, seemed to possess the power of independent motion. The light faded or even disappeared under a stronger breeze, to re-appear on its dying away. The spot where this light I am describing centered was near a tank in some flat ground traversed by a small sluggish stream, and a tank margin is a common spot for such lights to be seen on. I can add little more regarding the mysterious appearance, save my conviction that its origin has yet to be traced out and established; my own belief in favor of a congregation of luminous insects being hesitatingly adopted for want of a better, and the fact, as I take it, of the light shifting its position indepen-

dently of the wind, whose stronger force only causes its temporary extinction.

“Your’s sincerely,

“ (Sd.) W. THEOBALD, *Junior*.

*Bassein, 1st April, 1863.*”

“N. B.—I have forgotten perhaps the most important observation I made with respect to this light—viz., that it is decidedly fluctuating like that of a revolving light of a lighthouse. After a certain period of ordinary brightness the light increases in size and brightness and rapidly attains its maximum effect, after which it slowly fades, sometimes to a mere speck barely visible, or even disappears for a minute or two.”

5. From Lieutenant-Colonel Phayre, a paper on the history of the Burman race.

6. From the same, a memorandum on some ancient tiles obtained at Pagan, in Burmah.

7. From Major General Cunningham, a paper entitled “Remarks on the Bactro-Pali inscription from Taxila.

Mr. Bayley prefaced the reading of Major General Cunningham’s paper by the remark that he had transmitted some time before to Mr. E. Thomas, in England, a tentative translation of the greater portion of the inscription, the general purport of which agreed with that now given by Major General Cunningham, save on one or two important points—viz., the supposed name of the king and of the month, also as to the name of the Satrap’s son, but that he would reserve fuller remarks until the receipt of Professor Dowson’s paper.

Major General Cunningham’s communication having been read, Baboo Rajendralal Mitra said that since the publication of the last number of the Journal he had devoted some attention to the Taxila inscription and prepared a translation of it, which though generally similar, was, as regards the interpretation of several words, different from the version submitted to the meeting by Major General Cunningham. He pointed out those differences in detail and advanced some reasons which led him to think the General’s determination of the name of a Greek month upon the relic, open to question. The original paper and the Baboo’s comment on it will appear in an early issue of the Journal.

Mr. Bayley agreed with Baboo Rajendralal Mitra that the

of the month was not that of a Greek month in the present instance, and believed further that the era used was that of the Great King Kanishka, which he believed to be probably identical with that of Vikramaditya.

The Chairman announced that Mr. Waterhouse, Royal Artillery, had brought to the meeting a fine series of photographs of the Bhilsa Topes, copies of which he offered to present to the Society.

The offer was accepted and the thanks of the meeting were voted to Mr. Waterhouse.

The Librarian then submitted the usual report.

#### LIBRARY.

The following additions have been made to the Library since the last meeting.

#### *Presented.*

Memoirs of the Literary and Philosophical Society of Manchester. Vol. IV. Part 2, and Vol. V. Parts 1 and 2, Second Series—Vols. III. to XV. and Vol. I. Third Series—BY THE SOCIETY.

A New System of Chemical Philosophy by John Dalton, F. R. S., Vol. I. Part 1, and Vol. II. Part 1.—BY THE SAME.

Meteorological Observations and Essays by John Dalton, D. C. L., F. R. S.—BY THE SAME.

Proceedings of the Literary and Philosophical Society of Manchester, Vol. II. Sessions 1860-61 and 1861-62.—BY THE SAME.

Bye-Laws and Regulations of the L. and P. Society of Manchester.—BY THE SAME.

The Annals of Indian Administration, Part 1, of Vol. VII.—BY THE BENGAL GOVERNMENT.

Annaler for Nordisk Oldkyndighed for 1859.—BY THE COPENHAGEN SOCIETY.

Mémoires de la Société Royale des Antiquaires du Nord, 1850-60.—BY THE SAME.

Inscriptions Runiques der Slesvig Méridional, interprétees par C. C. Rafn.—BY THE SAME.

Abhandlungen der Akad. d. Wissenschaften Zu Berlin for 1861.—BY THE BERLIN ACADEMY.

Extracts from the Meteorological Observations taken at the of the Royal Engineers in the years 1853-4, 1854-5, 1855-6,

1856-7, 1857-8, and 1858-9, edited by Col. Sir Henry James, R. E., F. R. S., &c.—BY THE SECRETARY OF STATE FOR WAR.

Archiv für Kunde Österreichischer Geschichts-Quellen, Vol. XXVII. Part 1.—BY THE SOCIETY.

Appendix No. 5, with a map of the Nizam's dominions.—BY THE BENGAL GOVERNMENT.

Almanach der Kaiserlichen Akademie der Wissenschaften, Zwölfter Jahrgang, for 1862.—BY THE VIENNA ACADEMY.

Atlas Van Over Nievo Guinea.—BY THE NETHERLAND SOCIETY.

Bijdragen tot de Taal,—Land. en Volkenkunde Van Nederlandsch Indië—Vijfde deel.—BY THE SAME.

Bulletin de l'academie Imperiale des Sciences de St. Petersburg, Vol. IV. Nos. 3-6.—BY THE IMPERIAL ACADEMY.

The Charter, Bye-Laws and Regulations of the Zoological Society of London, incorporated March 27, 1829.—BY THE SOCIETY.

The Calcutta Christian Observer for April.—BY THE EDITORS.

Remarks on the Topography and Diseases of the Gold Coast. By R. Clarke, Esq. (Read before the Epidemiological Society, May 7th 1860).—BY THE AUTHOR.

Grammatices Palicæ by G. S. Guestphalus. —BY DR. WEBER.

Finale as in Sanskrit vor Tönenden; from p. 385 to 404. By Dr. Weber.—BY THE AUTHOR.

Die Fossilen Mollusken Band II. Parts 3 and 4, by Dr. Hornes, —BY THE VIENNA MUSEUM.

Considerations on the Phenomena attending the fall of Meteorites on the Earth. By W. Haidinger (From the Philosophical Magazine for Nov. and Dec. 1861).—BY THE AUTHOR.

Journal of the Statistical Society of London Vol. XXVI. Part 1.—BY THE SOCIETY.

Journal of the Chemical Society of London, Nos. 5 and 6, of 1862. —BY THE SOCIETY.

Lexicon Geographicum—Decimus Fasciculus. By T. G. J. Juynboll.—BY THE LUGD. BATAVIAN ACADEMY.

Journal of the Proceedings of the Linnean Society—Zoology, Vol. VI. Nos. 21 to 23, and Botany, Vol. VI. Nos. 21 to 23.—BY THE SOCIETY.

Jahrbuch—Vol. XII. No. 2.—BY THE VIENNA MUSEUM.

Kaladlit Assilialiale or Woodcuts drawn and engraved by Greenlanders.—BY THE COPENHAGEN SOCIETY.

Indische Alterthumskunde by C. Lassen.—BY THE AUTHOR.

Land Anecdota Syriaca, Vol I.

List of Vertebrated animals living in the gardens of the Zoological Society of London, 1862.—BY THE SOCIETY.

List of the Linnean Society of London, 1861.—BY THE SOCIETY.

List of the Royal Society of London, 20th Nov. 1861.—BY THE SOCIETY.

Contents of the Correspondence of Scientific men of the 17th century. Compiled by Augustus De Morgan, F. R. A. and C. P. S. 1862. Pamphlet.—BY THE COMPILER.

Memoires de l'academie Imperiale des Sciences de St. Petersburg, Vol. IV. Nos. 1 to 9.—BY THE IMPERIAL ACADEMY.

Notices of the Proceedings at the meeting of the members of the Royal Institution of Great Britain for 1861-62.—BY THE INSTITUTION.

The Oriental Baptist for March.—BY THE EDITOR.

Oriental Christian Spectator for Jan. and Feb.—BY THE EDITOR.

Proceedings of the Royal Geographical Society of London, Vol. VII. No. 1.—BY THE SOCIETY.

Proceedings of the Royal Society of London, Vol. XII. No. 53.—BY THE SOCIETY.

Photographs of Views in Kashmir.—BY CAPT. MONTGOMERIE.

Photographs illustrating the hill tribes on the Peshawur Frontier.—BY CAPT. MELVILLE.

Proceedings of the Royal Society of Edinburgh, Vol. IV. No. 56.—BY THE SOCIETY.

The Proceedings of the scientific meetings of the Zoological Society of London, Part 3, of 1861 and Parts 1 and 2, of 1862.—BY THE SOCIETY.

The Quarterly Journal of the Geological Society, Vol. XIX. No. 73.—BY THE SOCIETY.

Annual Report on the Administration of the Province of Oudh, for 1861-2.—BY THE BENGAL GOVERNMENT.

Annual Report of the Branch of the Marine Department under control of the Government of India for 1861-2.—BY THE SAME.

Report of the Committee of the Bengal Chamber of Commerce from 1st May to 31st Oct. 1862.—BY THE CHAMBER.

Streiter's *De Sunahsepo Fabula Indica ex codicibus manuscriptis edita*.—BY THE AUTHOR.

Schoenborn's *Aitareya Brahmanae Specimen*.—BY THE EDITOR.

Selections from the Records of the Madras Government, Nos. 72 and 74.—BY THE BENGAL GOVERNMENT.

*Sitzungsberichte der Kaiserlichen Academie der Wissenschaften, Philos.—Histoire Classe, Vol. XXXVIII. Part 3, and Vol. XXXIX. Part 1; Mathematische Classe, Vol. XLV. Part 1, Heft 1 and 2, Part 2, Heft 1, 2, 3 and 4.*—BY THE ACADEMY.

Table of high and low water at the Kidderpore docks, for 1863.—BY MR. J. OBBARD.

Transactions of the Royal Irish Academy, Vol XXIV. Part 2.—BY THE ACADEMY.

Transactions of the Government of India in the Financial Department in 1861-62.—BY THE BENGAL GOVERNMENT.

Transactions of the Linnean Society of London, Vol. XXIII. Part 2.—BY THE SOCIETY.

Transactions of the Royal Society of Edinburgh, Vol. XXIII. Part 1.—BY THE SOCIETY.

Transactions of the Zoological Society of London, Vol. IV. Part 7, and Vol. V. Part 1.—BY THE SOCIETY.

Weber's *Indische Studien*, Vol. V. Parts 2 and 3.—BY THE EDITOR.

*Journal Asiatique*, Vol. XX. No. 79.—BY THE SOCIÉTÉ ASIATIQUE DE PARIS.

#### *Exchanged.*

The Athenæum for January and February.

The London and Edinburgh Philosophical Magazine, Vol. XXIV. Nos. 166 and 167.

#### *Purchased.*

Gould's *Birds of Asia*, Parts 1 to 14.

Dabry's *La Médecine chez Les Chinois*. By M. J. Léon Soubeiran.

*Numismatic Chronicle and Journal of the Numismatic Society of London, New series*, No. 8.

The Parthenon, Vol. II. Nos. 38 to 46.

The American Journal of Science and Arts, Vol. XXXV. No. 4

*Conchologia Iconica*, by Lovell Reeve, Parts 222 to 225.

Annales des Sciences Naturelles, Zoologie, Vol. XIX. No. 1.

Revue et Magasin de Zoologie, No. 12 of 1862, and No. 1 of 1863.

Revue des Deux Mondes for 15th January, February and 1st March.

The Annals and Magazine of Natural History, Vol. XI. Nos. 62 and 63.

Wolf's Zoological Sketches, *Second series*, Parts 3 and 4.

Comptes Rendus, Vol. LVI. Nos. 2 to 7.

Journal des Savants for Dec. Jan. and Feb.

Zenker's Bibliotheca Orientalis, Part 3.

Sir Charles Lyell on the Antiquity of Man.

LALGOPAL DUTT.

6th May, 1863.

#### FOR JUNE, 1863.

The Monthly General Meeting of the Asiatic Society of Bengal was held on the 3rd Instant.

A. Grote, Esq., in the chair.

Mr. H. F. Blanford, at the Chairman's request, read the proceedings of the last meeting, which were confirmed.

Presentations were received—

1. From Professor T. Goldstücker, a copy of his *Mánava Kalpa Sutrás*, and its preface entitled *Pánini*, and parts 1 to 4 of his *Sanskrit Dictionary*.

2. From Mr. Oldham, on the part of Lieutenant-Colonel J. C. Haughton, a small collection of flint implements from the Andamans.

The following letter accompanied the box, which had been overlooked in the office of the Geological Survey, in consequence of its having been enclosed in another box, alleged to contain shells only, and addressed to the Museum of Economic Geology :—

*Port Blair, 29th November, 1861.*

MY DEAR SIR,—I send you for submission to the next meeting a collection of what I take to be Andamanese arrow-tips; with them is an English flint arrow-tip (No. 1) for comparison. All the specimens

o. 2 were found on the site of an old Andamanese encampment to the spot where Blair had his garden in 1789-90. I also angle iron arrow-head about the size and shape of the ace of

spades in playing cards. It has unfortunately been mislaid. The specimen No. 2, found this morning on the top of Ross Island, where no flint has yet been found, appears either very much weathered or to be altered by fire. All the Andamanese arrows seen during the last two years were either tipped with longish spikes, consisting of nails, convicts' anklets, beaten-out pieces of saws, stolen from us, or they have had a long point of hard wood. I do not remember to have seen any mention of flint implements among the Andamanese before; we must conclude, therefore, that if the specimens now sent were really used for the purpose I suppose, then they belong to an age when iron derived from the wrecks of ships was not to be had around these Islands.

Your's truly,

(Sd.) J. C. HAUGHTON.

*To the Secretary, Asiatic Society.*

3. From Mr. A. Grote, on the part of Colonel Tytler, a Python from the Nicobar Islands, believed to be a new species, and two species of Herodias from Port Blair, also believed to be different from the Bengal species.

4. From Lieutenant-Colonel James, skin and skeleton of a *Khatass (Viverra Zibetha)*.

5. From Baboo Rajendra Mallika, skin and skeleton of a Snow Bear.

6. From Mr. H. F. Blanford, an extra copy of his paper on the "Specific Identity of the Described Forms of Tanalia," published in the 23rd Vol. of the Transactions of the Linnean Society of London.

7. From the Madras Central Museum, a collection of Natural History specimens chiefly consisting of fish.

8. From Baboo Frankissen Shaw, skin and skeleton of a *Paradoxurus Musanga*.

The following letter from Lieutenant-Colonel S. R. Tickell, announcing the dispatch of two stone shot, and enclosing list of the kings of Arakan, was read.

*Akyab, May 14th, 1863.*

MY DEAR GROTE,—Will you kindly present to the Society the accompanying two stone round shot. They were dug up out ramparts of the Old Fort of Arakan, by Captain Hamilt



Superintendent of Police, at whose request I forward them and beg you will kindly mention him as the donor.

Accompanying is a list of Kings who reigned in Arakan, holding their courts in the city and fort of that name. The city was called the "Old City" (Myohoung) or "Myouko," (the Yam) indifferently. The meaning of the latter name I cannot discover. It was commenced in 1430 A. D., by Khyaw-moon, but not completed till 1531, by Mengba, who armed the fort and established in the ramparts the magazines, which have now been dug into.

The shot are made, you will observe, very symmetrically. It is possible they may have been purchased, with "pierriers," or stone mortars, as they were called, from old Portuguese or other European voyagers. Of guns not a trace has yet been met with in or near the fort, and it is probable they were carried away by the Burmese invaders subsequent to the last Arakan king Sanay, in 1652.

Believe me, &c.,

(Sd.) S. R. TICKELL.

A. D.

|                    |      |                    |
|--------------------|------|--------------------|
| Saumoon .....      | 1430 | commenced city.    |
| Aleykheng .....    | 1434 |                    |
| Kullama Saya ..... | 1459 |                    |
| Dau Shya .....     | 1482 |                    |
| Meng Nyo .....     | 1492 |                    |
| Yansung .....      | 1492 |                    |
| Salengathoo .....  | 1493 |                    |
| Meng Sau ..        | 1500 |                    |
| Kasabuddee .....   | 1522 |                    |
| Theereethoo .....  | 1524 |                    |
| Thazata .....      | 1525 |                    |
| Mengba .....       | 1531 | finished the city. |
| Meng Tikkha .....  | 1553 |                    |
| „ Sanhla ..        | 1555 |                    |
| „ Rikya .....      | 1562 |                    |
| „ Paloung .....    | 1584 |                    |
| „ Raza .....       | 1603 |                    |
| „ Khamoung .....   | 1626 |                    |
| Theereethoo .....  | 1636 |                    |
| „ y .....          | 1652 |                    |

A letter from Mr. J. J. Gray, intimating his desire to withdraw from the Society, was recorded.

The following gentlemen, duly proposed at the last meeting, were balloted for and elected ordinary members :—

W. Clementson, Esq. ; Colonel G. W. Hamilton ; Captain G. C. Depree ; T. D. Forsyth, Esq., c. b. ; Baboo Chunder Sekur Roy ; T. H. Thornton, Esq., c. s. ; Hon'ble G. Campbell.

The following gentlemen were named for ballot as ordinary members at the next meeting :—

H. S. Kane, Esq., m. d., proposed by Mr. H. B. Medlicott, and seconded by Mr. H. F. Blanford.

H. L. Porter, Esq., c. s., proposed by Mr. Grote, and seconded by Mr. Blanford.

C. Horne, Esq., c. s., proposed by Mr. Atkinson, and seconded by Mr. Bayley.

The Council proposed Richard H. Barnes, Esq., of Gangarowa, Ceylon, as a Corresponding member.

The Council reported that they had adopted the recommendation made by the Philological Committee in the following report on the subject of the MSS. of the late Sir Henry Elliot :—

#### *Report of the Philological Committee.*

The Committee have had under consideration a proposition which has for its object an endeavour to secure the publication, even in an imperfect form, of the valuable materials which the late Sir Henry Elliot had collected for his work on the Mohammedan Historians.

It was the wish of many members of our Society, eight years ago, to offer the Society's aid to Lady Elliot in carrying out the author's project, but no proposition was made, because it was hoped and understood that the more powerful assistance of the Home Government would be given to that end.

The Committee are aware that the late Board of Control, in their letter, dated 4th August 1856, to Professor Wilson, and Messrs. Morley and Bayley, sanctioned the printing of the three first vols. of the Elliot MSS. which had been left ready for press, on the understanding "that the payment by the Court in respect of the three vols. is to be strictly limited to the sum of £500, including the remuneration of the gentleman who may undertake the superintendence of the

tion." It was hoped that the publication of the further vols. might be effected by means of private efforts.

Messrs. Austin's estimate for publishing these three vols. which included a reprint of the 1st vol. altered by the author (500 pp. per vol.) including Oriental type, corrections, and cloth-binding, was £200.

Mr. Bayley, who had examined all the materials, reported on them thus;—Vols. 4 and 5 far advanced; 6 and 7, materials and outlines only ready; 8, nearly as far advanced as vols. 10 and 11, which are about, say, half ready; 9, in an equally forward state with the three first vols.

The arrangement which was made with Mr. Morley for publishing the work to the extent of the Board of Control's grant was terminated by that gentleman's death, and no similar arrangement has since been found feasible. It seems to the Committee that there is great risk of the late Sir H. Elliot's labours being altogether lost, unless the Society comes forward with an offer to undertake the superintendence of the publication.

They think that an arrangement on some such plan as the following might be made with Lady Elliot in whose possession the materials are.

1.—The publication to be a special series under the title of the "Elliot Papers," or "Remains," under the superintendence of the Philological Committee, as the *Bibliotheca Indica* is published.

2.—This Committee to undertake the carrying each vol., as it stands, through the press. No editorial amendments or alterations to be made.

3.—The charges to be defrayed from the late Court's grant to such extent as this can be made to go. If the Society fail to get this special grant increased they might, with the necessary permission, continue the publication at the charge of the Oriental Fund. Vol. 12 will not be required. It was to contain selected texts, but the Society is already publishing its own selection of these texts in the new series of the *Bibliotheca Indica*.

None of the vols. from 4 to 11, apparently will be full vols. It is probable that on Mr. Austin's estimate for the cost of three volumes, the Society will be able to print the whole for from £900.

4.—The materials to be placed at the Committee's disposal by Lady Elliot. With Mr. E. Thomas' co-operation in England, the Committee will be in a condition to determine what they will require to be sent out and what portion may be left with him, or accessible to him, for compliance with references made to him from this Committee.

5.—Proceeds of the publication to be credited to the Oriental Fund till such time as it shall have been reimbursed for all charges.

The Committee forbear at present to go further into details. The proper time for these will be after obtaining the sanction of the Council and of a general meeting to their communicating with Lady Elliot with a view to entering on an undertaking such as that which is outlined above. They are prepared for great difficulties, but the alternative of facing these is, they fear, to lose the benefit of the researches of one of their most distinguished members.

(Sd.) A. GROTE.  
E. C. BAYLEY.  
W. N. LEES, Capt.  
RAJENDRALAL MITRA.  
E. B. COWELL.  
W. S. ATKINSON.

30th April, 1863.

After the report had been read the Chairman, in a few words, urged its adoption on the meeting, and some additional explanations of the state in which he had left the materials were given by Mr. E. C. Bayley.

The report was unanimously adopted.

The Chairman observed that he had received a communication from Captain Lees, stating that he was prevented by indisposition from attending the meeting, and requesting that he might be allowed to defer the motion of which he had given notice.

He further observed that in Mr. Oldham's absence the two motions of which he had given notice must also be necessarily postponed. As the notice of these motions had been published in the last meeting's proceedings, he was anxious to explain to the meeting that the Council generally disapproved of both. They did not consider that the management of the Journal was open to the reflections implied in the first, and they were satisfied that the Government grant been duly appropriated to the service of the Museum. It

expedient to state thus much in anticipation of the discussion that would probably follow on Mr. Oldham's return to Calcutta, when the motions would, he presumed, be duly brought forward.

Communications were received—

1.—From Mr. H. F. Blanford, a note on a tank section at Sealdah.

Mr. Blanford read his paper, and a vote of thanks was passed to him.

2.—From Mr. E. B. Cowell, a paper on the Persian game Chaugán or Hockey on Horseback.

Mr. Cowell read his paper and the thanks of the meeting were accorded to him.

3.—From Captain H. G. Raverty, an account of Upper Kashkar and Chitral, or Lower Kashkar, together with the independent Afghan State of Punj-Korah, including Talash, being a continuation to his "Notes on Kafiristan."

4.—From Capt. H. H. G. Austen, notes on the system employed in outlining the figures of Deities, and other religious drawings, as practised in Ladakh, Zanskar, &c.

5.—From Baboo Gopinath Sen, Abstract of the Meteorological Observations taken at the Surveyor General's Office, in March last.

The Librarian submitted the usual monthly report.

#### LIBRARY.

The following accessions have been made to the Library since the Meeting in May last.

#### *Presented.*

On the specific identity of the described forms of *Tanalia*, by Mr. H. F. Blanford.—BY THE AUTHOR.

The Calcutta Christian Observer for May.—BY THE EDITORS.

Report on Epidemic remittent and intermittent fever occurring in parts of Burdwan and Nuddea Divisions, by Dr. J. Elliott.—BY THE BENGAL GOVERNMENT.

Dictionary, Sanskrit and English, Vol. I. Parts 1 to 4.—BY PROFESSOR T. GOLDSTUCKER.

*Mánava Kalpa Sūtras*.—BY THE SAME.

Panini, his place in Sanskrit Literature.—BY THE SAME.

Memoirs of the Geological Survey of India, *Palæontologia Indica*,

—BY THE MUSEUM OF ECONOMIC GEOLOGY.

, Ditto.—BY THE GOVERNMENT OF INDIA.

'The Oriental Baptist for April.—BY THE EDITOR.

Report on the result of the Administration of the Salt Department for 1861-62.—BY THE BENGAL GOVERNMENT.

Selections from the Records of the Bombay Government, No. 68.—BY THE BOMBAY GOVERNMENT.

Selections from the Records of the Bengal Government, No. 39.—BY THE BENGAL GOVERNMENT.

Transactions of the Bombay Geographical Society, Vol. XVI.—BY THE SOCIETY.

LALGOPAL DUTT.

*3rd June, 1863.*

#### FOR JULY 1863.

The Monthly General Meeting of the Asiatic Society of Bengal was held on the 1st instant.

A. Grote, Esq., in the chair.

The proceedings of the last meeting were read and confirmed.

Presentations were received --

1. From Major J. L. Sherwill—Specimens of locusts from a flight which passed over Raneeungee on the 1st June.

2. From E. Lockwood, Esq. C. S.,—A large collection of birds' eggs.

3. From Captain E. Smyth,—Skins of birds and animals from Thibet.

4. From Dr. C. Williams,—A collection of bird skins from Burmah.

5. From Major J. T. Walker, Superintendent, Great Trigonometrical Survey,—2 copies of Tables of heights in Sind, the Punjab, N. W. Provinces and Central India.

6. From the Director of the Hydrographischen Anstalt der K. K. Marine, Trieste,—A copy of the first part of "Reise der Oesterreichischen Fregatte Novara um die Erde" with seven lithographed maps.

7. From Mr. A. Grote on the part of Lieutenant Colonel R. Tytler,—A second Python from the Nicobar Islands.

8. From Captain H. Howe,—A Somali wooden pillow and

9. From J. F. Shekleton, Esq., M.D., Officiating Assay Master,—A copy of the Assay Tables, in continuation of Tables VIII. and IX. of Mr. James Prinsep.

A letter from Mr. D. Fitzpatrick, intimating his desire to withdraw from the Society, was recorded.

The following gentlemen, duly proposed at the last meeting, were balloted for and elected ordinary members :—H. S. Kane, Esq., M.D. ; G. E. Porter, Esq., C. S. ; C. Horne, Esq., C. S.

R. H. Barnes, Esq., of Ceylon was also balloted for and elected a Corresponding member.

The following gentlemen were named for ballot as ordinary members at the next meeting :—

Coomar Chunder Nath Roy of Nattore, proposed by Mr. H. C. Sutherland and seconded by Mr. Cowell.

Baboo Bunkim Chunder Chatterjea, B. A., proposed by Baboo Gour Doss Bysack and seconded by Mr. Atkinson.

The Council reported that they had adopted the following report of the Philological Committee.

#### REPORT OF THE PHILOLOGICAL COMMITTEE.

The Philological Committee submit the following suggestion to the Council :

In 1854 Dr. Sprenger published the first Vol. of a catalogue of Persian MSS. at the expence of the government ; similarly in 1855 Dr. Ballantyne published the first Vol. of the great Sanscrit grammar, the *Mahābhāṣya* with native commentaries ; and in 1860 Dr. Hall published his Contribution to an Index of the Hindu Philosophical Systems. These three works possess respectively great value to European scholars, but unfortunately they are almost entirely unknown even by name in Europe. The Secretary has made enquiries of the Curator of Government Books at Allahabad, and he has learned that the stock of the two latter works is at Allahabad, but we fear that the first mentioned work on Persian Literature was probably destroyed during the mutiny.

As the Government so liberally advanced the expence for the printing of these books, it can hardly have been their intention that volumes when printed, should remain locked up from the learned who alone could appreciate them. Now if fifty or eighty ordered for distribution among the principal learned socie-

ties and the leading Orientalists of Europe, Oriental science would be benefited, and the original object of government in printing the books forwarded.

A large portion of the edition of the Rigveda, commenced by the late Court of Directors, and continued by Her Majesty's Government, has been gratuitously distributed in this manner.

The Philological Committee would therefore suggest that a proposition should be made to Government for the distribution of fifty or eighty copies, and the Society might offer to send the books to their respective destinations along with its own publications, government paying any extra expence.

The report was adopted.

Communications were received.

1. From Dr. C. Williams, extracts from a journal of his trip from Mandalay to Bhamoo, containing some accounts of a visit to old Pagan.

The paper was read by the Secretary.

After its perusal the chairman observed that he was in hopes of receiving further communications shortly from Dr. Williams through Colonel Phayre. The Doctor had reported the Bhamoo river to be navigable for steamers up to Bhamoo. He had not found it practicable, in consequence of the disturbances in Yunan, to reach the Chinese frontier, but he had travelled in that direction as far as the Kakhyan mountains.

2. From the Under-Secretary to the Government of Bengal, copy of a journal kept by Mr. J. W. Masters, late Assistant Commissioner at Golaghat, during a tour made by him towards the end of last year in Upper Assam.

3. From Baboo Gopinath Sen an abstract of the hourly meteorological observations taken at the Surveyor General's Office in April last.

The chairman then addressed the meeting, calling its attention to the intelligence which had just reached India of the successful issue of Captains Speke and Grant's expedition, in Eastern Africa.

Some of the members present, he observed, might probably have known these officers who were both placed by the Home Government at the disposal of the Royal Geographical Society on the 24th. ruary 1860. Captain Speke he had had the pleasure of seeing he



he came down some 10 years ago to proceed to join Burton's expedition to the Somali country ; though never a member of this Society, he had contributed to the museum a fine collection of zoological specimens made by him under great difficulties in the course of that expedition, and he was a frequent correspondent of the Society's Curator, Mr. Blyth. In later years his efforts in aid of African exploration had been made known through European journals, and they obtained for him in 1861 the gold medal of the Royal Geographical Society.

His first experiences as a traveller were gained in sporting tours in the Western Himalaya, where, as the Society were aware, there was at present another equally enterprising man, long known as a sportsman on and beyond the passes into Thibet, who was only waiting for a mission such as the London Geographical Society entrusted to Captains Speke and Grant, to emulate those officers in their exertions and to achieve, it might be hoped, the same brilliant success. He trusted that now that there was no longer room for doubt as to the sources of the White Nile, we might be able to draw more attention to the doubts that still hang over the sources of the Berhampootur, the solution of which Captain Smyth, with a trusty few, was ready and eager to attempt.

Feeling confident that amid the applause which awaited the travellers in England, a greeting from their old friends in India and from this Society, would be most acceptable to them, he would move a resolution in the following form for the adoption of the meeting :

That this meeting desire to record the high gratification with which they have heard of the successful issue of Captains Speke and Grant's expedition in Eastern Africa, and to offer to those officers their warm congratulations on the great discoveries which have resulted from it.

The Resolution was unanimously adopted.

Captain Lees then brought forward a motion for amending Rule 77 of the Bye-Laws, the notice of which was given at the May meeting.

He stated in a few words his reasons for proposing an alteration in the rule. His object was to prevent the recurrence of discussions regarding the present mode of conducting the Society's journal, which had lately occupied, he thought, too much of their time at more than 1 of their meetings. He wished to see the Rule amended as follows :  
1 Council shall elect from their own body Sub-committees or

sections of Oriental Literature, Natural History, &c., also a Subcommittee of Finance, whose reports on all matters referred to them shall be submitted to the Council.

The chairman then read the Rule as it now stands, and moved that Captain Lees' proposed amendment be referred to the Council for report in accordance with Rule 43 of the Bye-Laws.

Agreed to.

The Librarian submitted the usual monthly report.

#### LIBRARY.

The additions made to the Library since the meeting held in June last are as follows :—

#### *Presented.*

Accidents on Railways in India during the year 1861.—BY THE BENGAL GOVERNMENT.

Annual Report on the administration of the Bombay Presidency for 1861-62.—BY THE BOMBAY GOVERNMENT.

The Prayer Book in the Burmese language.—BY THE TRANSLATOR.

The Calcutta Christian Observer for June.—BY THE EDITORS.

Catalogue de Livres Anciens et Modernes, Part 4.—BY THE COMPILER.

Lecture on Buddhism, By G. M. Tagore.—BY THE AUTHOR.

Dictionary Sanskrit and English, Vol. I. Part 5.—BY PROFESSOR T. GOLDSTUCKER.

Journal of the Chemical Society, 2nd series, Vol. I. Nos. 1 to 3.—BY THE SOCIETY.

Journal of Sacred Literature and Biblical record, Vol. III. No. 5.—BY THE EDITORS.

Mittheilungen der Hydrographischen anstalt der, K. K. Marine, Trieste, Band I. Heft 1, with seven maps.—BY THE ACADEMY.

Memoirs of the Geological Survey of India, Palæontologia Indica, Part 5.—BY THE BENGAL GOVERNMENT.

Proceedings of the Royal Society of London, Vol. XII. Part 54.—BY THE SOCIETY.

Report of the Committee of the Bengal Chamber of Commerce, from 1st Nov. 1862 to 30th April 1863.—BY THE CHAMBER.

Report on the administration of the N. W. Provinces for 1861.—BY THE GOVERNMENT N. W. PROVINCES.

Weekly Statement of Meteorological Returns of the N. W. Provinces from June 1861 to May 1862.—BY THE SAME.

Treaties, Engagements, Sunnuds, &c., Vol. II.—BY THE GOVERNMENT OF INDIA.

Tables of Heights in Sind, the Punjab, the N. W. Provinces and Central India, published under the superintendence of the Trigonometrical Survey of India, 2 copies. By the Superintendent G. T. Survey of India.

Journal Asiatique Sixième Serie, Vol. I. No. 1.—BY THE SOCIÉTÉ ASIATIQUE DE PARIS.

*Exchanged.*

The Athenæum for March, 1863.

The London and Edinburgh Philosophical Magazine and Journal of Science, Vol. XXV. No. 168.

*Purchased.*

Bopp's Sanskrita Sprache, Part 2.

The Edinburgh Review for April, No. 240.

Hewitson's Exotic Butterflies, Part 46.

Notices et Extraits des Manuscrits de la Bibliothèque Impériale, Paris, Vol. XIX. Part 1.

Numismatic Chronicle and Journal of the Numismatic Society of London, New Series, No. 9.

The Parthenon, Vol. II. Nos. 47 to 50.

Reinaud's Catalogue Annuaire Française, Vol. V.

Revue et Magasin de Zoologie, No. 2 of 1863.

Revue des Deux Mondes for 15th March 1863.

Annals and Magazine of Natural History, Vol. II. No. 64.

The Westminster Review for April 1863.

Dr. Weber's Indische Studien, Vo. VII. Part 3.

Comptes Rendus, Vol. LVI. Nos. 8 to 11.

Journal des Savants for March 1863.

The Natural History Review for April 1863.

LALGOPAL DUTT.

1st July, 1863.

# JOURNAL

OF THE

# ASIATIC SOCIETY.

No. IV. 1863.

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*Contributions to Indian Malacology. No. IV. Descriptions of new land shells from Ava, and other parts of Burma.—By WILLIAM T. BLANFORD, Associate of the Royal School of Mines, F. G. S.*

The species of land shells described in this paper are a few of peculiar interest selected from a numerous collection of novelties obtained in Pegu and Upper Burma. A far larger number remain to be examined, as well as several new species of Estuary and Marine shells from the Irawadi delta and the coasts of Arakan.

I trust hereafter to be able to furnish drawings of the species now described, as well as of those published in a previous number of these contributions.

Genus *SPIRACULUM* Pearson : emend.

Shell depressed, sub-discoidal, covered with a thick epidermis, sometimes hairy; aperture circular; last whorl furnished, a short distance behind the mouth, with a short reverted sutural tube, open at both ends, anteriorly inside the body whorl, and posteriorly into the air.

Operculum concentric, horny, multispiral, convex or flat; edges of the whorls externally free and raised, similar to that of *Pterocyclos*.

Animal similar to *Cyclophorus* and *Pterocyclos*, except that the mantle is deeply notched, (in *Sp. Avatum*,) the notch corresponding to the sutural tube.

## 1. *SP. AVATUM*, n. s.

Shell convexly depressed, widely umbilicated, marked with radiating striæ and covered, (in young specimens,) with a thick scab

epidermis; colour white, with broad zigzag chesnut stripes crossing the whorls, and a wide submedian band of the same colour surrounding the shell. Spire scarcely raised, suture deep. Whorls  $4\frac{1}{2}$ , rounded; the last cylindrical, descending slightly and gradually towards the mouth, and bearing, 3 mm. behind the aperture, a short reverted sutural tube curved into an arch, so that its posterior termination is close to the suture, and open at both ends. Aperture slightly oblique, circular. Peristome, (in well grown specimens,) double, the inner lip continuous and slightly protruded, angulately incised at the suture. Outer lip expanded and produced, close to the last whorl, into a small vertical tongue-shaped projection. Operculum multispiral, almost flat, with a central prominent nucleus within, slightly concave externally, the edges of the outer whorls being free and slightly raised.

|                             | mm.            | inch |
|-----------------------------|----------------|------|
| Major diameter, .....       | 17             | 0.68 |
| Minor ditto, .....          | 14             | 0.56 |
| Altitude, .....             | 8              | 0.34 |
| Diameter of aperture, ..... | $5\frac{1}{2}$ | 0.25 |

Hab. Shan Hills, east of the town of Ava.

Of this most interesting shell, I only obtained two specimens, one alive and in good condition, but barely full grown, the other old, worn and dead: one was picked up at the base, the other on the top of the range of hills lying to the east of the beautiful valley, in which are situated the present and former capitals of the kings of Burma.

The genus *Spiraculum* was proposed in 1833, (J. A. S. Vol. II. p. 391) by Dr. Pearson, then Curator of the Asiatic Society of Bengal, for the reception of the anomalous *Sp. hispidum*, and also of *Pterocyclos parvus* from the Khasi hills. Mr. Benson had, a very short time previously, in 1832, published the description of the allied genus *Pterocyclos*, (J. A. S. Vol. I. p. 11) and Dr. Pearson proposed to substitute the name *Spiraculum*, under the idea that the type of Mr. Benson's genus was an imperfectly developed shell. Dr. Pearson was entirely in error, as was shewn soon after by Mr. Benson, (J. A. S. Vol. V. p. 355) whose generic name has been universally adopted, while Dr. Pearson's appellation has been treated a synonym by many authors, by Dr. Pfeiffer amongst others, while the brothers and a few other conchologists have preserved the name *Spira-*

*culum*, but have restricted it to the only species hitherto described as possessing a tube, viz. *Sp. hispidum*,\* (*Pterocyclos hispidus*). The discovery of a second species shews that this separation is justified. The genus is distinguished from *Pterocyclos* both in the possession of this small tube, which recalls the same process in *Opisthoporus* Bens. and also in the absence of the "wing" or cowl-shaped free process of the outer lip in the peristome of *Pterocyclos*, which is represented by the small linguiform projection of *Spiraculum*. There also appears, if the character of the mantle of *Sp. Avatum* prove constant, to be a distinction in the animals; for although several species of *Pterocyclos* have been carefully examined, no peculiarity in the animal has been found to correspond to the singular formation of the peristome, while in the present species of *Spiraculum* there is a deep notch in the mantle, corresponding to the tube in the shell.

A third and very singular species of *Spiraculum* exists in Assam, but has not yet been described. I am disposed to consider the genus as forming an important link between the *Cyclophoridae*, certain forms of the *Pupinidae*, and the aberrant genus *Alycæus*.

The present species is distinguished from *Sp. hispidum*, Pearson, by its smaller size, by the epidermis being only slightly rough, instead of hairy, and by the sutural tube being nearer the mouth, and bent backwards in the form of an arch. The projection of the outer lip near the suture is vertical instead of horizontal. The operculum is far flatter, resembling in this character, that of the Burmese species of *Pterocyclos* e. g. *Pt. pullatus*, Bens.

## 2. CYCLOPHORUS HISPIDULUS, n. s.

Shell widely umbilicate, subplanulately depressed, radiately striated and marked by extremely fine and close concentric impressed lines, white, covered with a thick dark brown epidermis, which forms a broad raised spiral costulation around the shell, more marked in young than in fully grown specimens. Spire almost flat, apex just exerted, suture deep. Whorls 5, cylindrical, the last descending very little near the aperture, which is subvertical and circular. Peristome double, inner lip continuous and projecting a little; outer lip slightly expanded. Operculum multispiral, externally flat, the margins of the

\* Gen. Rec. Moll., H. and A. Adams, Vol. II. p. 278, the following is the description given. "Shell with a reverted, closed tube or spiracle, situated on the suture near the aperture." The tube is not closed however, but open, interior aperture being more or less in the form of a longitudinal slit.

whorls being very rough and free, internally very slightly concave, with a minute central nucleus projecting.

|                             | mm. | inch |
|-----------------------------|-----|------|
| Major diam., .....          | 14  | 0.55 |
| Minor ditto,.....           | 12  | 0.5  |
| Altitude, .....             | 7   | 0.28 |
| Diameter of aperture, ..... | 5   | 0.15 |

Habitat. Mya Leit Doung, near Ava.

This species, with *C. calyx*, Bens., from Molmain, and *C. pinnulifer*, Bens. from the Khasi hills, forms an extremely well marked section of the genus *Cyclophorus*, having indeed quite as good claim to separation as some acknowledged genera, e. g. *Leptopoma*. All are distinguished from other discoid species by a scabrous epidermis, and an operculum with raised edges to the whorls externally, thus exactly resembling that of the Burmese forms of *Pterocyclos* and *Spiraculum*, to the former of which genera this little group forms a passage. If considered worthy of separation as a subgenus of *Cyclophorus*, I would suggest for it the name *Scabrina*.

The description of *C. calyx* by Mr. Benson in the Ann. and Mag. Nat. Hist. for 1856 (2nd series, Vol. XIX. p. 228) must have been taken from a dead specimen which had lost both its epidermis and operculum. In living specimens, brought to me by a collector whom I sent to Molmain, the shell was covered with a scabrous dark epidermis, radiately striated, and with raised spiral lines which, as in *C. hispidulus*, were more marked in young than in adult individuals. The operculum was slightly concave externally, in consequence of the edges of the whorls being raised and ragged, especially near the circumference; internally it was smooth and nearly flat, with a small central nucleus. *C. calyx* is well distinguished from *C. hispidulus* and *C. pinnulifer* by its smaller whorls, the strong subangulation around the umbilicus, the ornamentation beneath the epidermis, and the markings of the epidermis itself, the raised ridges surrounding the shell being fewer and much more pronounced in *C. hispidulus*.

In *C. pinnulifer* the mouth is larger, and the markings on the epidermis very oblique, instead of concentric, and somewhat irregular. The operculum is very Pterocycloid with rough raised edges to whorls.

3. *ALYCÆUS VULCANI*, n. s.

Shell moderately umbilicated, depressly turbinate, thin, translucent, varying in colour from amber to nearly white, rather closely costulated throughout, more strongly upon the inflated portion of the last whorl, and very closely ribbed within the umbilicus. Spire conoid, apex blunt, deep rufous; suture impressed. Whorls 4, rounded, the last moderately swollen at the side, then constricted, and swelling again slightly towards the mouth. Constriction smooth; sutural tube of moderate length, about 2 mm. Aperture oblique, round, peristome crenulately waved on the outer edge, the lowest crenulation forming a rudimentary channel at the base; peristome double, the inner alone continuous, both lips somewhat expanded. Operculum thin, horny, distinctly multispiral, very concave externally, internally convex and with a prominent central nucleus.

|                    | mm. | inch. |
|--------------------|-----|-------|
| Major diam., ..... | 4½  | 0.18  |
| Minor ditto, ..... | 3½  | 0.14  |
| Alt. ....          | 3   | 0.12  |
| Diam. ap. ....     | 1½  | 0.05  |

*Habitat.*—This species abounds on the upper portion of the isolated peak of Puppa, an extinct volcano lying about 40 miles E. S. E. of the town of Pu-gán in the territories of the king of Ava. It is a more globose form than either *A. Succineus*, mihi, or *A. polygonoma*, mihi, to which it is allied. The crenulation of the mouth is perhaps more marked than in any other Burmese species.

4. *ALYCÆUS AVÆ*, n. s.

Shell depressed, openly umbilicated, thin, closely costulated throughout, more strongly upon the inflated portion of the last whorl, white or light amber in colour. Spire very depressly conoid, apex blunt, suture impressed. Whorls 4, the last very little inflated at the side, then moderately constricted, constriction rather long, swollen in the centre, indistinctly costulated. Sutural tube short, about 1½ mm. in length. Aperture circular, diagonal. Peristome thickened, double, external lip expanded, inner continuous and projecting slightly at the base. Operculum, thin, horny, multispiral, very concave externally and convex within, wanting the central boss.



|                    | mm. | in.  |
|--------------------|-----|------|
| Major diam. ....   | 3½  | 0.14 |
| Minor ditto, ..... | 3   | 0.12 |
| Alt., .....        | 2   | 0.08 |
| Diam. ap., ...     | 1   | 0.04 |

*Hab.*—The hills East of Mandalay and Ava.

This species approaches *A. Strangulatus*, Hutt. which is larger and more discoid.

#### 5. *ALYCEUS RICHTHOFFENI*, n. s.

Shell umbilicated, turbinate, rather solid, closely flexuously costulated, more strongly so on the inflated portion. Spire conical; apex rather acute; suture impressed. Whorls 5, rounded, the last moderately swollen at the side, and sub-angulate at the periphery, and more strongly so round the umbilicus, then much contracted, ascending slightly at the inflation, descending considerably behind the aperture. Constriction slightly costulated, crossed by a very prominent vertical ridge. Sutural tube of moderate length, about 2½ mm. Aperture circular, very oblique. Peristome continuous, double, the inner lip projecting slightly, and waved 3 times on the dextral side. Outer lip broadly and flatly expanded. Operc. ?

|                    | mm. | in.  |
|--------------------|-----|------|
| Major diam., ..... | 5   | 0.2  |
| Minor ditto, ..... | 4   | 0.15 |
| Alt., .....        | 4   | 0.15 |
| Diam. ap., .....   | 1½  | 0.06 |

*Hab* —Molmain.

I am indebted to Baron F. v. Richthofen for the only specimen of this shell which has been found. It is perfect, but bleached. The species is quite distinct in type from any Indian or Burmese form with which I am acquainted; it combines a high conical spire with a strong ridge on the constriction, but it recalls somewhat the Javanese *A. Jagori*, Martens. I have much pleasure in naming this interesting little form after the discoverer, to whom I was also indebted for some living specimens of *Raphaulus chrysallis*, Pfr. and other Molmain shells.

#### 6. *DIPLOMMATINA PUPPENSIS*, n. s.

Shell dextral, not rimate, elongately subovate, thin, translucent, light amber in colour, very finely and closely costulated, spire with

convex sides, apex pointed, not acuminate, suture impressed. Whorls 7, the antepenultimate being the largest, last whorl rising considerably upon the penultimate. Aperture vertical, nearly circular, the columellar margin being straight, with an obtuse angle at the base, and furnished with a small tooth internally. Peristome double, orange in colour; both lips expanded, the inner forming a thin callus upon the penultimate whorl. Operc. thin, horny, white, circular, flat, with no distinct spiral structure.

|                  | mm. | in.  |
|------------------|-----|------|
| Alt., .....      | 3½  | 0.15 |
| Diam., .....     | 2   | 0.08 |
| Diam. ap., ..... | 1   | 0.04 |

*Habitat.*—Puppa Hill in Upper Burma with *Alycæus Vulcani*.

The largest species yet discovered in Burma and the most symmetrical, so far as I know, of all Asiatic forms. None of the Burmese representatives of *Diplommata* shew the strongly acuminate spire, or the great swelling of the antepenultimate whorl which distinguishes the species inhabiting the Himalaya.

#### 7. DIPLOMMATINA EXILIS, n. s.

Shell dextral, not rimate, very slenderly subfusiform, rather solid, moderately, closely and obliquely ribbed throughout. Spire turreted with straight sides, apex obtuse, suture impressed. Whorls 7½, rounded, antepenultimate slightly larger than the penultimate. Lower whorl rising a little near the aperture, which is subvertical, slightly inclined downwards, almost circular, the columellar margin being straightened, terminating in a right angle at the base, and bearing a moderate-sized internal tooth. Peristome double, the inner lip being prominent, slightly expanded, and continuous upon the penultimate whorl, but not forming a broad callus; outer lip, slightly expanded, retro-relict. Operc. ?

|                  | mm. | in.  |
|------------------|-----|------|
| Alt., .....      | 8   | 0.12 |
| Diam., .....     | 1½  | 0.05 |
| Diam. ap., ..... | ¾   | 0.03 |

*Habitat.*—Mya Leit Doung, Ava.

The most slender species of the genus with which I am acquainted, and easily distinguished by this character from all others, by its long narrow form.

8. *HYPSELOSTOMA BENSONIANUM*, n. s.

Shell moderately umbilicated, turbinate, not distinctly striated, thin, horny. Spire conical, apex papillar and with the axis oblique, suture deep. Whorls 4, the upper ones flattened, the last bulging below the suture, and again at the periphery, (where it bears a prominent rounded keel,) rounded beneath, and compressed towards the umbilicus. It rises somewhat towards the mouth, which is round, nearly vertical, slightly turned upwards, free from the other whorls, and furnished inside with 5 lamellar teeth, 4 of which are equidistant and opposite to each other, at the upper and lower corners of the mouth, so as to form a partial St. Andrew's cross, while the fifth, which is smaller, is close to and above that at the upper corner of the parietal margin. Peristome free, simple, broadly expanded and trumpet-shaped.

|                           | mm. | in.  |
|---------------------------|-----|------|
| Major diam., .....        | 3   | 0.12 |
| Minor ditto., .....       | 2½  | 0.09 |
| Alt., .....               | 2   | 0.08 |
| Diam. of peristome, ..... | 1   | 0.04 |

*Hab.*—Mya Leit Doun, Ava.

The differences between this shell and *Hypselostoma tubiferum*, Benson, hitherto the only known species of the genus, are numerous. That shell has the spire scarcely exerted, while the last whorl ascends so much that the mouth, which is horizontal, is on a level with the apex. In the present species, the spire is conical, the mouth nearly vertical, and the last whorl only ascends very slightly. In *H. tubiferum* also, there are more teeth in the mouth, they are situated further back from the aperture, and are somewhat differently disposed, the upper two lamellæ being produced in front of the others, and forming an imperfect tube. There are also minor differences in striation, umbilicus, &c. Nevertheless the general appearance of the two species is strikingly similar, and the peculiar shape of their whorls and mouth recalls those of the Brazilian genus *Anostoma*, Lam.

*Hyps. Bensonianum* occurred together with *H. tubiferum* on the high limestone peak of Mya Leit Doun about 20 miles South of Mandalay, the present capital of other kingdom of Ava. *H. tubi-*  
has also been found over a wide range of country. It occurs

on the Tsagyen hills, north of Ava, famous for their marble quarries, and on various hills in Pegu as far south as Henzada. In some places hundreds of specimens may be found adhering, in dry weather, to the surface of limestone rock, upon which alone it appears to occur, in the same manner as species of *Pupa* and *Clausilia* are frequently found in Europe, though rarely in India.

The animal of *H. tubiferum* is very small and black, of the usual Helicoidous form, with 4 tentacles, and so far as I could observe, presented no peculiarity.

*A memoir on the Rats and Mice of India.*—By EDWARD BLYTH.

The following must be regarded as merely a somewhat rude attempt to reduce the present utter chaos of Indian *Muridæ* to some kind of approximation to systematic order; at all events, to present a *Conspectus* of the long series of names and descriptions, that should facilitate the future study of these small animals, and conduce eventually, no doubt, to an extensive reduction of the number of named species, and to the rectification of their perplexed synonyms. At all events, I have brought together every notice which I could find, descriptive of the *Murine* animals of India and the countries adjacent.

Genus GERBILLUS, F. Cuvier.

The Gerbilles are a group of burrowing field-rats, common (as a genus) to Asia and Africa, of gracile form, with small fore-limbs and inversely developed hind-limbs, a longish furred tail, the hairs of which are gradually lengthened towards the extremity into a kind of tuft, and with distinctly grooved upper rodential tusks. There appears to be one Indian species only.

G. INDICUS; *Dipus indicus*, Hardwicke, *Tr. Lin. Soc.* VIII. 279, pl. 7; F. Cuv., *Mamm. Lithog.*, II, t. 73 (not good); Hardwicke, *Ill. Ind. Zool.*—*G. Cuvieri*, Waterhouse, *P. Z. S.* 1838, p. 56;—*G. Hardwickei*, Gray, *Br. Mus. Catal., Mamm.*, p. 132;—*Meriones apicalis* (?), Kuhl, apud Gray; *Mus jencus*, B. Ham., *M. S.*; 'Desert Rat' of Elphinstone's 'Cabul' (*vide* Introduction).\* For description of habits, *vide* W. Elliot, Esq., in *Madr. Journ. Lit. Sc.* X, 211.

\* The 'Desert Rat' of Arthur Conolly, 'Overland Journey to India,' I. 54, refers to the Jerboa (*ALACTAGA INDICA*, erroneously so called, of Gray).

On careful comparison of numerous specimens from Afghánstán, Sindh, Upper Hindustan, Lower Bengal, Midnapore district, Madras Presidency, and Ceylon, I am satisfied that all belong to one and the same species; the differences which have been stated to exist being merely indicative of individual variation.

A second species, however, inhabits Afghánstán,—the *G. ERYTHROURA*, Gray, *Ann. Mag. N. H.* X, (1842), p. 266: *vide* also *J. A. S.* XV. 139, Dr. Gray states—"Hab. *India*, Afghánstán." I doubt if it inhabits India, any more than does his *Alactaga indica*, *ibid.* p. 262, from "*India*, Candahar, at Quetta;" or his *LAGOMYS RUFESCENS*, *ibid.* p. 266, from "*India*, Cabul;" these latter animals are not at all likely to be found on the Indian side of the passes into Afghánstán, but are inhabitants of a region possessing essentially an European climate.

#### Genus NESOKIA, Gray.

*Ann. Mag. N. H.* X. (1842), p. 264. "Cutting teeth very large, flat in front, and smooth; grinders 3-3; front upper, large with three cross ridges; the middle oblong, and the hinder much narrower behind, each with two cross-ridges; hinder each with two ridges, the hindmost smallest, rather narrow behind; tail short, thick, with whorls of scales and scattered bristles; toes 4-5, moderate, the three middle sub equal, long, the outer moderate; claws small, compressed; front thumb tubercular, with a rudimentary claw; ears moderate, naked.

"This genus is easily known from *Mus* by the large size of the cutting teeth and the comparative shortening of the tail; it appears to be intermediate to the Rats and RHIZOMYS," (J. E. Gray).

I have studied both *MOROMA* and *RHIZOMYS* alive, in their indigenous haunts, and living examples of both of them; and can perceive no particular approximation in the instance of these two genera.

*N. INDICA*; *Mus indicus*, Geoffroy, Desmarest, p. 474; Lesson, *Manuel*, p. 266; Brandts *Maiz*, p. 114, t. 35; Schinz, *Synopsis Mammalium*, II. 174; *Arvicola indica*, Gray, *Hardw. Ill. Ind. Zool.*

"*M. supra cano-rufescens, subtus canescens; pedibus dorso concoloribus, cauda corpore paululum brevior; auriculis magnis, rotundatis, fuscis, nudiusculis; cauda nigricante. Pili omnes basi cani. Magnitudinæ M. decumani. Habitat. circa Pondichery.*"

In his Catalogue of the specimens of mammalia in the British Museum, Dr. Gray cites the name *M. indicus*, Geoffroy, as a synonym of his *Mus Kok*; the former name having the priority by many years; but in his subsequent Catalogue of the specimens presented by B. H. Hodgson, Esq. to the British Museum, Dr. Gray gives *M. indicus*, Geoff., as a separate species, and refers to

it the *M. rattus* (P) v. *rattoides* of Hodgson, the description of which indicates a very different animal, with tail longer than the head and body. He also dubiously refers the *M. brunneusculus*, Hodgson, to the same.

This is undoubtedly the common shortish-tailed field Rat of all India, with Ceylon; varying somewhat in shade of hue according to the colour of the soil on which it dwells. Though the reverse of gracile in its appearance, with much of the aspect of an *arvicola*, it is marvellously rapid in its movements, as it plays about the entrance of its burrow!\* And the type, if not the same species, occurs in Afghānsthān; but I have not seen it from the eastward of the Bay of Bengal though it is likely enough to occur in the dry climate of the region of the upper Irawādī.

The Indian animal is excellently described by the Hon'ble Walter Elliot, in the *Madr. Journ. Lit. Sc.* X, 209 (1839), by the name *Mus* (*Neotoma*) *providens*, with *M. indicus*, Geoff. and *Arvicola indica*, Gray, cited as synonyms, and the Canarese name *Kok* or *Koku* also assigned to it.† He gives an elaborate account of the habits of the animal; and remarks that—"A variety found in the red soil is much redder in colour than the common *Koku* of the black land. Another variety, he adds, "is said to frequent the banks of nullahs, and to take to the water when pursued; but the specimens I have seen differed in no respect from the common kind, (of which they appeared to be young individuals,) except in size." "The dimensions of an old male were as follow:—length of body, 7 in.; of tail  $6\frac{1}{2}$  in. [1] sole  $1\frac{4}{6}$  in., weight 6 oz. 5 dr." According to my observation, the tail has not exceeded  $5\frac{1}{2}$  in., from any part of the country.

In the *Proc. Zool. Soc.* for 1835, p. 108, it is recorded that specimens were exhibited of eight species of Rats and Mice, collected in India by Walter Elliot, Esq. They were brought under the notice of the meeting by Mr. Gray, who stated that five of them were hitherto undescribed \* \* \*. The mouse which Mr. Gray has figured from Gen. Hardwicke's drawings, in the 'Illustrations of Indian Zoo-

\* The species of RHIZOMYS are rather slow in their movements.

† "It seems necessary," remarks Mr. Elliot, "to distinguish this species by a new name, that of *indicus* being too general and indefinite. Geoffroy's animal is not sufficiently particularized, to indicate which of the Indian species he meant; and Gray's was given under the supposition that it applied to an *ARVICOLA*, which, he subsequently discovered, it did not (*P. Z. S.* 1835, p. 108). The present term seems sufficiently applicable to its habit of laying up a large store of grain for its winter food."

logy,' under the name of *Arvicola indica*, is really a *MUS*. A second time, therefore, the specific name *INDICUS* claims priority. Mr. Elliot subsequently presented specimens of this common Indian field Rat to the Society's Museum, which are before me as I now write.

In the *Mag. Nat. Hist. n. s.* I. (1837), p. 585, Mr. Gray describes a *Mus Kok* (!), with the synonym of *Arvicola indica*, Gray. "Length of body (dry)  $9\frac{1}{2}$  in., tail  $4\frac{1}{2}$  in.; hind-feet  $1\frac{3}{4}$  in. Inhabits India." Doubtless from one of Mr. Elliot's specimens; but how different the admeasurements taken from a dry skin! On the same occasion he describes a *Mus Hardwickei*. "Very much like *M. Kok*, but the skull is much wider and stronger, and rather larger; and the cutting teeth are nearly twice as wide, and are flat in front. The grinders are very little larger than those of that species. Inhabits India; gardens." I considerably suspect that these are merely adult and young of the same species! With numerous specimens before me from Lower Bengal, the Midnapore district, the Carnatic, S. Malabar, and Ceylon, I can recognise one species only, varying a little in shade of hue from different localities, and also somewhat in quality of fur, unless this latter difference may prove to be seasonal, as is not improbable. In his catalogue of the specimens of Mammalia in the British Museum, p. 110, Mr. Gray retains his *M. Kok* under *MUS*, and gives as synonym *M. (Neotoma) providens*, Elliot, *Arvicola indica*, Gray, and also *MUS INDICUS*, Geoffroy. (Why, therefore, not adopt this last and much the oldest name for the species?). And at p. 113, well removed from the former, he gives *NESOKIA HARDWICKEI*, v. *Mus Hardwickei*, Gray, and no other species is referred by him to *Nesokia* in that catalogue. But in his catalogue of the specimens and drawings of Mammalia and birds of Nepal and Tibet, presented by B. H. Hodgson, Esq., to the British Museum (1846), the *Kok* v. *providens*, is assigned to *Nesokia*.\*

So common and widely diffused a Rat as this is, throughout the plains of India, must needs be found in the valley of Nepal; and, if so, will be sure to have received one or more names from Mr. Hodgson.

\* The late Dr. Kelaart, in his *Prodromus Faunae Zeylanicae*, recognises apart *Nesokia Hardwickei*, Gray, (*Mus dubius*, Kelaart), and *Nesokia Kok*, Gray (*Arvicola indica*, Gray, and *Neotoma providens*, Elliot). A Cinghalese specimen presented by him to the Society is undoubtedly of the common Bengal species. His *N. Kok* appear to have been described from a distorted stuffed specimen, of at most a slight individual variety to the best of my judgment; and he states it "Dentition as in the last species." (!)

One and probably more than one of the following descriptions in the *Ann. Mag. N. H.* XV. (1845), pp. 267—8, are likely to refer to *M. INDICUS*; and not any of these names occur either in the *Br. Mus. Catal.* of Dr. Gray, nor in the late Dr. Horsfield's Catalogue of the specimens of Mammalia in the India-House Museum, (1850); but some of them are noticed, as will be shewn, in the *Br. Mus. Catal.* of Mr. Hodgson's specimens.

"*MUS* ? *PYCTORIS*,\* *H.* characterized by its bluff face with short thick muzzle, and by its short tail, one-third short of the length of the animal. Pelage of two sorts, with the long piles sufficiently abundant, colours of *rattoides*, or of dusky-brown, with a very vague rufous tinge. Below fulvescent; long hairs all black; rest with hoary bases and black points. Inner piles mostly dusky. Snout to vent 7 in.; tail 4½ in.; head 1½ in.; ears ⅓; palma ⅔; planta 1¼. Tenants the woods only;—"i. e. open jungle? (I take this to be a synonym of *NESOKIA INDICA*.)

"*MUS MYSTHRIX*, *II.* Remarkable for its soft mouse-like pelagi, and for its tail covered with hairs, so as to conceal the annulated skin nearly. Fur soft, short, and of one kind only; colours clear; above dull fawn, below fulvescent. The piles above are dusky at their roots, black in their centres, and red at their tips. The tail is still shorter than in *Mus* ? *pyctoris*, being not two-thirds of the length of the animal. Snout to rump 6 in.; tail 3¼; head 1½; ears ⅓; palma ⅔; planta 1⅛. Tenants the woods only, dwelling in burrows under the roots of trees, but not gregariously." (*Qu.* young of *NESOKIA INDICA* ?)†

"*MUS* (?) *HYDROPHILUS*, *H.* [*Arvicola hydrophilus*, *H.*, *J. A. S. X.* 915, [apud Gray]. Small Water-Rat of Nepal. Dwells in holes on the margins of ponds and rivers: characterized by its small ears, which are hardly above one-third the length of the head; also by its short tail, and by a pelage that is short and fine, though not so mouse-like as in the last. Above dusky-brown, below and the limbs nearly white. Long piles inconspicuous. Head larger and muzzle thicker than in the common land Rats. Snout to vent 3½ in.; tail 2¾ in. head 1¼ in.; ears ⅓ in.; palma ½; planta ⅞.‡

\* In *Br. Mus.*, a "specimen with skull, in very bad state." Also a "drawing, of natural size"—"Inhab. Nepal, central and northern hilly region." "Fur soft, dark brown, minutely gray varied, with scattered narrow, white bristles. Lower cutting teeth very narrow, rounded in front, middle of belly whitish. Tail nakedish. Hind-feet 1 in. 3 lin.; tail 4 in.; (imperfect) body and head 7 in.; skull 1½ in." (Gray).

† In *Br. Mus.*, "a flat skin, without fore-limbs; tail skinned at the end;" and "a drawing of natural size." "Inhab. Nepal, central and northern hilly region." "Fur yellow-brown, minutely black-varied; hair rather short and rigid, lead-coloured, with yellow tips, and with scattered narrow black bristles; beneath yellowish-white; tail hairy, yellow, hind feet 1 in.; tail 3¼ in." (Gray.)

‡ *NESOKIA HYDROPHILA* apud Gray; who also admits his *Nesokia* (!) *kok* from Nepal, v. *M. pyromidens*, Elliot, &c. In *Br. Mus.*, a "specimen without tail, imperfect skull, and drawing of adult and young, nat. size. Grey-brown, beneath whitish; fur very soft, with rather elongated, very slender, soft, longer hairs;



"MUS (?) MACROPUS, H. A Water-Rat like the last, but twice as large. Distinguished by the largeness of its feet, and also by the fine pelage and the proportions of the last, as well as by a similar bluff face, though less so than in *M. (?) pyctoris*. Above smoky black, below smoky-grey. Legs dark, toes pale. Snout to rump  $7\frac{1}{4}$  in.; tail 6 in.; head  $2\frac{1}{8}$  in.; ears  $1\frac{1}{8}$  in.; palma plus 1 in.; planta  $1\frac{1}{8}$  in.; weight 6 oz." (Hodgson.)

In *J. A. S. XV.*, 139, I referred a species from the extreme *N. W.* of India and Afghánstán, to this *Nesokia* group by the name *Mus Huttoni*, nobis; and Mr. F. Moore has since described a *Nesokia Griffithii*, Horsfield, from Afghánstán, in the Catalogue of the Indian-House specimens of mammalia, which is probably the same animal, notwithstanding certain discrepancies in the descriptions.

*N. HUTTONI*, nobis—"Bears a near resemblance to *M. INDICA* (v. *kok*), but the tail is shorter and the general colour much lighter, resembling that of the Gerbilles. On comparison of the skulls, the Zygomatic arch is seen to be conspicuously broader anteriorly; and the palate is much narrower, and contracted to the front: but the most obvious distinction consists in all the teeth, both incisive tusks and grinders, being considerably broader and stronger. In other respects, the skulls of these two species bear a very close resemblance. Length, minus the tail, about 6 in.; the tail, (vertebræ,) 4 in.: tarsus with toes and claws,  $1\frac{1}{2}$  in.; ears posteriorly  $\frac{1}{2}$  in.; to antear base  $\frac{3}{4}$  in. Fur soft and fine, blackish for the larger basal half of the piles—the surface pale rufescent-brown, deepest along the crown and back, pale below, and whitish on the throat; whiskers small and fine, and chiefly black; tail naked; feet light-brown: incisive tusks buff-coloured; the enamel of these has been partially worn away on those of the upper jaw." (Bl.)

This animal "occurs south of Bwhawulpore, and is abundant in Afghánstán, from Quetta to Girishk, throwing up the mould after the manner of the mole. It feeds on herbs and seed, and burrows in the ground beneath hedge-rows and bushes, as well as along the banks and ditches. Its nest is deep-seated, and it constructs so many false galleries immediately below the surface, that it is difficult to find the true passage to its retreat, which dips down suddenly from about the middle of the labyrinth above. In the gardens and along the sides of water-courses in the fields at Kandahar, their earth-heaps are abundant." (Hutton.)

*NEKOKIA GRIFFITHII*, Horsfield "Fur very soft and silky: colour above, dusky chesnut-brown with streaks of a plumbeous tint, the separated hairs being of a leaden-colour at the base, and chesnut-brown towards the extremity; chin, chest, and under parts of a lighter tint, passing into a greyish-leaden colour on

ears moderate, rounded; whiskers black at the base, slender, weak; front cutting teeth broad, yellow; grinders very large, much larger than in *Mus bandicota*. Hind-foot 1 in. 8 lin.; skull to back of palate 1 in.  $1\frac{1}{2}$  lin.; grinders  $4\frac{1}{2}$  lines long and 2 lines wide." (Gray).

the abdomen. Ears moderately large: thumb of the fore-feet very minute. Cutting teeth flat anteriorly, comparatively large, broad and nearly white. Tail nearly naked, and shorter than the body. Length from snout to root of the tail,  $6\frac{1}{2}$  in.; of the tail 3 in. Hab. Afghānsthān, Pushut. (F. Moore.)

The skin of the body of the specimen was probably a little stretched, and that of the tail shrunk, if the caudal vertebræ were not retained within it, as is very commonly the case with skins prepared for stuffing of this group of animals.

All of the foregoing names are applied to animals of a bluff *arvicoline* or vole-like aspect, with tail shorter than the head and body; excepting the *M. rattus* et *rattoides* of Hodgson, which Dr. Gray refers to *M. indicus* as adopted by him, whatever that species may prove to be, though it does not seem likely to turn out a *Nesokia*, and is not classed as such by Dr. Gray.

MUS BANDICOTA, Bechstein; founded on the *Bandicota Rat* of Pennant's 'Quadrupeds,' p. 377; the name, according to Mr. Elliot, being a corruption of *Pandi-Koku* (literally Pig-rat), Telegu, of the Wuddur caste, S. India:\* *M. giganteus* Hardwicke, VII. p. 306, t. XVIII.; *M. perchal* et *M. malabaricus*, (Pennant) Shaw; *M. ikria*, B. Ham. (*ined.*); *M. nemorivagus*, Hodgson, *Ann. Mag. N. H.* XV. (1845), p. 206, *J. A. S. V.* 234, *M. (Neotoma) giganteus*, Elliot, *Madr. Journ. Lit. Sc.* X. 209 (who thus classes it in the same particular division as the *NESOKIA INDICA*).

Gen. Hardwicke figures and describes this huge Rat of extraordinary size; stating that—"The subject here described and figured was a female. Its weight was 2 lbs.  $11\frac{1}{2}$  oz. Its total length  $26\frac{1}{4}$  in., of which the tail measured from root to tip 13 in. The male grows larger and weighs 3 lbs. and upwards." Hence Mr. Hodgson was induced to consider his *nemorivagus* as distinct, being about one-third smaller. He gives:—snout to rump 12 in.; tail  $9\frac{1}{2}$  in.; weight 17 to 20 oz. "A full grown male," according to Buchanan Hamilton (*MSS.*), "measures  $10\frac{7}{10}$  in. from nose to tail, and the tail  $8\frac{3}{4}$  in." The stuffed specimens in the Society's collection are from Ceylon; and measure:—the head and body about 13 in., and tail (vertebræ)  $9\frac{1}{2}$  in. These well agree with Buchanan Hamilton's published figure.

I find, however, on reference to the late Dr. Kelaart's *Prodromus Faunæ Zeylanicæ*, that a large Cinghalese Bandicoot Rat measured

\* In Australia, the appellation 'Bandicoot' has been currently adopted: a genus of small marsupial animals, the *Perameles* of Shaw.

—"head and body 14 in.; tail 13 in.; weight 2 lbs. 10 oz. Rarely are larger specimens found."

Dr. Kelaart continues—"The Bandicoot is found in all parts of the island. Those from Newera Ellia are particularly large, and of a darker colour than those from the maritime provinces. A specimen found in the neighbourhood of Kandy, had a rufous tinge on the posterior portion of the back.\* \* \* These animals are very destructive to grain-crops. At Newera Ellia, they are the farmers' pest; fields of potatoes and beds of peas are much injured by these rapacious creatures; and the dove-cot and poultry-yards are not exempted from their attacks. Some classes of Malabars are very partial to the flesh of these Rats, and they are much sought after by the coolies on coffee estates, who eat them roasted."

The late Dr. Cantor includes this species in his catalogue of the Mammalia inhabiting the Malayan peninsula; but I have never seen it from the Indo-Chinese region. It inhabits various parts of India; but I never succeeded in procuring a fresh specimen from the vicinity of Calcutta. It is not unusual, however, here as elsewhere, to hear a full-grown *MUS DECUMANUS* designated a 'Bandicoot.' This huge species would seem to be intermediate in habits as in structure, to *M. INDICUS* and *M. DECUMANUS*.\*

*M. SETIFER*, Horsfield, figured in his Zoological Researches in Jáva: *M. giganteus* juv. Temminck, apud Gray. "Allied to the *M. BANDICOTA*, but clearly distinct as a species." Horsfield's Catalogue. Inhabits Sumátra, Jáva and Borneo; and Dr. Cantor gives it from the Malayan peninsula (Penang), *J. A. S.* XV. 254. "The larger of two individuals, captured in gardens, measured:—head and body  $10\frac{1}{8}$  in.; tail  $7\frac{1}{2}$  in." (Cantor.) In his *Br. Mus. Catal.*, Dr. Gray mentions a 'black variety,' and a "brownish variety with face brown" from Tasmania! In the 'Zoology' of the voyage of the 'Samarang,' Dr. Gray has attempted a *Conspectus* of the Zoology of the Malayan peninsula and islands, wherein he includes but five species of *MUS*; viz., *M. SETIFER*,—*M. BANDICOTA*, from the Malayan peninsula, Jáva, and Sumátra, *M. DECUMANUS*, Pallas from Jáva, Sumátra, Banda, Borneo, Celebes, Amboyna, Timor, Malayan peninsula (Penang).

\* A "specimen, from Egypt," is given in the *Br. Mus. Catal.*, as the Egyptian Bandicoot, *M. GIGAS*.

*M. RUFESCENS*, Gray, apud Gray (*flavescens*, Elliot), from Penang, on the authority of Cantor; and *M. MUSCULUS* (?) apud Cantor, from Penang. We possess two specimens from Malacca, which bear considerable resemblance to each other except in size; but one is certainly not the young of the other, as shewn by the comparative size of the feet. Had they been of the same species, the feet of the smaller specimen would have been considerably larger. The larger of the two is perhaps the young of *M. SETIFER*; measuring about  $6\frac{1}{2}$  in. long: tail  $5\frac{1}{2}$  in.: hind-foot  $1\frac{7}{8}$  in.: auricles of medium size, naked: tail with close rings fringed with short setæ: fur rather coarse on the upper parts, approaching to the spinous character, and the soft under-fur not shewing at the surface; of an uniform yellowish rufescent brown above, a little paler below, passing into dull albescent on the throat: the whiskers reach to beyond the ears, and are of a shining dark brown colour; and there are only a few fine long hairs protruding beyond the general surface of the fur of the back; the smaller specimen appears to be the young of *M. ROBUSTULUS*, nobis, and is doubtless the *M. RUFESCENS* apud Cantor; but its fur tends somewhat unusually to be weakly spinous. The general colour is of a dull *murim*-brown above, slightly albescent below, passing to dull white on the throat. Length of head and body about  $4\frac{1}{2}$  in.; and of hind-foot  $1\frac{5}{8}$  in., *Mus setifer* is included in *M. ?* of E. L. Layard's 'List of the Mammalia observed in Ceylon,' *Ann. Mag. N. H.*, 2nd series, VII. (1851), p. 405; but not in Dr. Kelaart's *Prodromus Faunæ*.\*

*MUS DECUMANUS*, Pallas, *Glires*, 91; Buffon, *H. N.* VIII. t. 27: *M. juvanus*, Pallas, apud Schinz, *M. norvegicus*, Buffon. To this species Dr. Gray refers (with a mark of doubt), in his Catalogue of Mr. Hodgson's collection, the *M. decumanoides*, Hodgson, (*nec* Waterhouse, *nec* Horsfield), which does not appear to have been described; also *M. brunneus*, Hodgson, *Ann. Mag. N. H.* XV. (1845), 267; described as follows:

'*Mus brunneus*, H. Common house rat of Nepal. As nearly allied to *decumanus* as *nemorivagus* is to the Bandicoot, [*i. e.* identical]; above rusty-brown; below rusty, more or less albescent. Extremities pale, fleshy-white nearly. Tail barely longer than the head and body. Long pilos sufficiently numerous,

\* Another species has been (or is to be) described from those islands, by same naturalist, as *M. PALMARUM*. I have not seen any description. The would indicate the habits of *MUS RUFESCENS*.

but not rigid. Snout to vent  $9\frac{1}{2}$  in.; tail  $9\frac{1}{2}$  in.; head  $2\frac{1}{2}$  in.; ears 1 in.; palma  $\frac{1}{2}$  in.; planta  $1\frac{1}{2}$  in.; weight 12 to 15 oz. (Hodgson)."

"*M. brunneusculus*, H. Lesser Brown Rat of Nepal. Closely resembling the last, but considerably smaller, as proved by numberless specimens: above rusty-brown, below rusty. Extremities pale. Snout to vent  $8\frac{1}{2}$  in.; tail 9 in.; head  $2\frac{1}{2}$ ; ears 1; palma —?; planta —?; weight 9 to 10 oz." (This as before remarked, Dr. Gray assigns dubiously to *M. indicus*, Geoffroy, *apud* Gray; nec *M. indicus* *apud* nos.)

In the *Ann. Mag. N. H.*, N. S. XVI. (1855), p. 112, Dr. Horsfield describes:—

"*Mus tarayensis*, Hodgson. Nearly allied to *M. brunneusculus*. Colour of the body and head above, dark brown, delicately variegated with blackish and rufous hairs; a very slight gloss on the surface. Outer sides of the extremities, rather darker. Under parts from the chin to the vent, and inner parts of the extremities, greyish-brown, with a rusty shade. Tail shorter than the body, tapering to an abrupt tip.\* Head lengthened and compressed, muzzle gradually tapering to an abrupt tip—*Distinguishing character*. A dark-brown surface with a slight gloss. Head lengthened. Tail shorter than the body. Underneath rusty-grey. Mr. Hodgson's collection," continues Dr. Horsfield, "contains only a single specimen, and further observations are required to confirm the distinctness of this species."

MUS PLURIMAMMIS, Hodgson, *ibid.* "Colour above, brown, with a rufescent shade; fur soft, consisting of brown and rufous hairs intermixed in equal proportions, forming an uniform upper surface; a rather obscure band extending from the gape over the cheek, terminating under the ears; and the abdomen and adjoining parts, rufous-grey. Head proportionally short, muzzle abrupt, ears moderate. Tail equal in length to the body, tapering to a sharp point, and minutely annulated. Length of the head  $2\frac{1}{2}$  in.; of the body from the neck to the snout  $5\frac{1}{2}$ ; of the tail the same."

"The distinguishing character, according to Mr. Hodgson," remarks Dr. Horsfield, "rests on the number of teats exceeding that of other species; but the number is not stated!" This is perhaps a GOLUNDA?

Dr. Kelaart called "the attention of observers to a yellow reddish-brown variety of the common house Rat, found at Trincomali and Batticaloa which may probably," he suggested, "be the *Mus decumanoides* of Hodgson:—this Rat may be thus described;—above, dark yellowish-brown, with long thin black hairs. Beneath, dingy, or yellowish-ash, with a few long grey hairs. Shorter fur of the back very similar to that of *M. rufescens*, (Gray, v. *flavescens*, Elliot); but much darker and of a slight rufous or reddish shade on the rump and posterior limbs. Base of hairs ash. Feet brown; soles purplish. Length and body  $7\frac{1}{2}$  in.; tail  $8\frac{1}{2}$  in.; planta 1,  $1\frac{1}{10}$  in. This is the common

\* Qu. Mutilated and healed? E. B.

house Rat of Trincomali, smaller than the *MUS DECUMANUS*,\* of which we have seen only a few specimens in Trincomali, where it is rare in houses in the town; but abundant in the dock-yard. *MUS DECUMANUS* is not very common in the hilly parts of the island: other Rats seem to replace it altogether on still higher parts. At Newera Ellia, where we resided for seven months, not one was observed. But it will not be long, ere the Brown Rat will find its way there also. (*Prodromus Faunæ Zeylanicæ*, pp. 60-1.)

Dr. Kelaart also describes—

"*MUS CEYLONUS*, Kelaart. Fur soft, lead colour; hair of upper parts tipped with dark fawn and black. Ears large, naked. Whiskers tinged black. Tail longer than the head and body, scaly. Head and body  $4\frac{1}{2}$  in.; tail 6 in. This small Rat is found in out-houses in the cinnamon gardens at Colombo. I have no reason to think it to be the young of the former species. The teeth were well developed. The darker colour and long tail will easily distinguish this species from other Colombo Rats." (*Ibid.*, p. 61.)

The common European Brown Rat is nowhere a more intolerable nuisance than in Calcutta and its vicinity: but it is not generally distributed over the interior of the country. In S. India Mr. Elliot states that "it is not so common above the Ghâts as below." Col. Sykes, however, states that "the Norway or Brown Rat abounds in Dukhun." I observed it to be very numerous at Akyab; but further south, at Rangoon and Moulmein, also in Tavoy and Mergui, I remarked no traces of it; nor have we ever received specimens from that line of coast; though Dr. Cantor gives it from Penang, and notes it as "*cosmopolita*." Other sites in the intertropical Eastern Archipelago are noted in p. 334; and the nuisance that Dr. Kane found this species to be in the course of his arctic explorations is sufficiently described in his most interesting narrative. In N. America, Mr. Catlin describes its first appearance among the wigwams of the far west, where its advent was rather hailed at first by the red men, on account of its attacking and destroying the indigenous *MERIONES*; but it fast proved to be by far the greater pest of the two, and soon domiciled itself as completely among the red men as elsewhere. According to Fischer, this noxious animal was introduced into Europe about the year 1730, and the current statement is that it originated in Persia or its vicinity; if so, it should at least have spread into

\* "A large Brown Rat at Colombo measured, the head and body 10 in., and tail 11 in." (Kelaart.) A specimen with which he favored the Society an example of his small house Rat of Trincomali appears to me to be a half-g *M. NEMORALIS*! and a tailless specimen from Newera Ellia appears to be similar.

Afghánstán, where, according to Capt. T. Hutton, it would seem to be unknown in Kandahar (*J. A. S.* XV. 140). According to Mr. F. T. Buckland, "it made its appearance in Paris about the middle of the eighteenth century, and in England not many years earlier. It is now agreed by most naturalists," remarks this author, "that it is a native of India and Persia; that it spread onwards into European Russia, and was thence transferred by merchant-ships to England and elsewhere." (*Curiosities of Natural History*, 5th Edit. p. 62.)

If an indigenous inhabitant of *India*, it would undoubtedly be more generally diffused over this, if not also the neighbouring countries. I suspect that the trans-Baikalian region of E. Asia has at least as good a claim to the *discredit* of originating the abominable Brown Rat as any other. *MUS DECUMANUS* is included in the list of Mammalia inhabiting the Amur territories by Mr. E. G. Ravenstein, in his 'Russians on the Amur,' &c., (1861), p. 316; and again, at p. 323, "It is owing to the rapacity of the *MUS DECUMANUS* that the Tunguzians build their store-house on four poles, to keep the contents beyond its reach; and among the Goldi the Manchus are nicknamed 'Sungari,' i. e. *Rats*, on account of the rapacity with which they exact tribute." Whatever the extremes of temperature and climate, *MUS DECUMANUS* contrives to find itself a home, and to increase and multiply about human abodes and granaries, to the serious detriment of not quite all-subduing man! Calcutta specimens are undistinguishable from British; and I observe no marked difference in one received from Amoy, except that it is in finer pelage and rather brighter coloured than usual.

*M. DECUMANOIDES*, Temminck (*nec* Hodgson), is given in Dr. Horsfield's Catalogue of the Mammalia in the India House Museum: "two specimens, from Bengal, presented by Gen. T. Hardwicke." I have seen no description. Surely not *M. nemoralis*, nobis?

*MUS RATTUS*, L. (Buffon, *H. N.* VII. 278, t. 36.) The European Black Rat I have only seen from vessels in the port of Calcutta, which differs in no respect from others received from France. Mr. Elliot, in his 'Catalogue of Mammalia in the Southern Mahratta country' notes it as *e*," and Mr. Layard includes it from Ceylon, where Dr. Kelaart observed an individual in a house, in Trincomali, remarking that he had

not seen it from any other part of the island. "No doubt," he adds, the Black Rat has been introduced by ships which frequent the various ports of the island." This, and not *M. DECUMANUS*, is said to be the species which has overrun New Zealand, and is there supposed to have exterminated the frugivorous native Rat of the country, stated to have been of frugivorous habits.\* The *M. rattus* v. *rattoides* of Hodgson, Dr. Gray refers to *M. INDICUS*, Geoffroy. It is thus described.

"*M. rattoides*, H. Black Rat of Nepal as similar to the Black Rat of Europe, as the foregoing, [*M. brunneusculus*,] is to our Brown Rat, and bearing in Nepal the same relation the one to the other as in Europe. Above, dusky or blackish brown; below, dusky hoary. Limbs dark, fingers pale; tail decidedly longer than the body and head; long piles sufficiently numerous. Snout to vent  $7\frac{1}{2}$  in.; tail  $8\frac{3}{4}$ ; head  $1\frac{1}{2}$ ; ears  $\frac{1}{2}$ ; palma  $\frac{1}{3}$ ; planta  $1\frac{1}{2}$ ; weight 5 to 7 oz."

Specimens presented by Mr. Hodgson to the British Museum are marked as "A. B. Reddish, bad state. C. B. Rather brown, not good state. G. I. Three skulls, J? *Var.* darker, with whitish bristles, no hind-feet. *M. brunneusculus*, Hodgson E. (?)"

\* Referring, however, to the 'Fauna of New Zealand' in Dieffenbach's work, I find that he cites *MUS RATTUS*, L., with a note of doubt; and adds—"It would be interesting to see whether it is the European, the Indian, or the New Holland Rat, that has been introduced, or if there may not be more than one kind." What he means by the *European* or the *Indian* Rat is not so clear. But he adds—"There exists a frugivorous native Rat, called *Kiore maori* (indigenous Rat) by the natives, which they distinguish from the English Rat, (*not the Norway Rat*), which is introduced, and called *Kiore pakia* (strange Rat). On the former they fed very largely in former times; but it has now become so scarce, owing to the extermination carried on against it by the European Rat, that I could never obtain one. A few, however, are still found in the interior, viz., at Roturua, where they have been seen by the Rev. Mr. Chapman, who described them as being much smaller than the *Norway* Rat. The natives never eat the latter. It is a favorite theme with them to speculate on their own extermination by the Europeans, in the same manner as the English Rat has exterminated their indigenous Rat." (Dieffenbach's *Travels in New Zealand*, &c., II. 185.)

Mr. F. T. Buckland, however, quoting the *Field* newspaper, on the subject of the imported Rat of New Zealand, mentions that "with the exception of a small species of Rat, now nearly extinct, having been all but exterminated by the importation of the common *Norway* Rat, there is not a single indigenous animal [mammal] in the country; the Rats have become a serious nuisance." (Vide, however, p. 168 *antea* regarding a small aquatic furred quadruped not improbably an *ORNITHORHYNCHUS*.)

Of *MUS RATTUS*, Mr. Buckland writes—"The Black Rat, or as it is sometimes called the old English Rat, does not seem to be an aboriginal occupier of the British soil. The earliest mention of it is by Genov, in his *Historia Animalium*, published at Zurich about the year 1587. It is probable that it was introduced into Britain from Franco, the Welsh name for it being to this day, as I have it from a gentleman of Welsh extraction *Hygodyn Frenziz*,—the 'French mouse.' Certainly, the remains of neither *MUS RATTUS* nor of *M. DECUMANUS* have been found fossil in the British island, as those of *ARVICOLA AMPHIBIA* are so abundantly.



In a late No. of the Proceedings of the Linnæan Society\* it is shewn that, in London, the *M. DECUMANUS*, *M. RATTUS*, and *M. ALEXANDRIANUS*, interbreed and commingle, yielding fertile hybrids of all degrees of intermediateness.

*MUS ANDAMANENSIS*, Blyth, *J. A. S.* XXIX. 103. *M. Nicobariensis* (?) Scherzer, 'Zoology of Novara Expedition.'

The indigenous Rat of the Andaman Islands. Length about 8 in.; tail the same; ears much as in *M. DECUMANUS*. The fur a shade darker on the back than in that species, paler on the sides, and dull white below; the long piles at once distinguished by their flattened spinous character, which is also slightly the case in *M. RATTUS*, though much less conspicuously than in the present species. It would appear to be a burrower in the ground.

There are certain Indian Rats with the tail longer than the head and body, of arboreal habits, building nests in the branches of trees, never burrowing in the ground, and when they enter houses, (the commonest Bengal species (*M. RUFESCENS*) at least,) very commonly hide or attempt to hide during the day, in the *jilmils* or venetian blinds of apartments. The largest of these I have termed,—

*M. NEMORALIS*, Blyth, *J. A. S.*, XX. 168. This resembles the next, except in being considerably larger, much less rufescent above, and the under parts are merely paler or dull greyish brown, occasionally somewhat albescent. Length about 8½ in., tail 9½ in., hind-foot 1½ in. Inhabits Lower Bengal and also Ceylon.

*MUS RUFESCENS*, Gray, *M. N. H., N. S.*, I. (1837), p. 585, apud Gray, though the description does not apply, and the tail is stated to be shorter than the head and body, whereas the reverse is the case.†

\* *Proc. Lin. Soc.*, Feb. 6th, 1862, p. 66: also *Zoologist*, p. 7983.

† "*M. RUFESCENS*, Gray. House Rat [!] Fur pale brown; beneath, yellowish-grey. Under fur lead coloured, with numerous slender brown bristles, marked with a deep central channel, ending in a black hair-point; of the chin and under sides, softer, with whitish slender bristles. Tail nearly as long as the body [!], with rather small square scales, and very short hairs. Feet brown; claws white, covered with white hairs. Length of the body and head 6½ in.; tail 5½ in. [!], hind-foot 1½ in.; to base of thumb 7½ lines. Inhabits India."

It is utterly impossible to recognise the species from the foregoing description. On the same occasion Dr. Gray described—

"*M. ASIATICUS*, Gray. Pale brown blackish, varied. Ears large, nakedish, chin and beneath, greyish. Whiskers elongate, black. Tail as long as ly and head, with short adpressed black hairs, longer and more abundant Cutting teeth smooth, and yellow in front. Thumb of fore-feet ntary, slightly clawed. Sole of hind-feet bald to the heel, with six outer hinder largest. Heel narrow, one-third the length of the foot.

*M. flavescens* et *rufus*, Elliot; *M. arboreus*, B. Ham., Horsfield's Catalogue, and figured by this name in one of B. Hamilton's unpublished coloured drawings; (vide *J. A. S.*, XX. 168); *M. montanus*, *Kandianus*, et *tetragonurus*, Kelaart *J. A. S.*, XX. 169, 185. In general about 7 in. long, with tail 8 to 8½ in. Colour rufescent, brown above, white or yellowish white beneath, mostly abruptly separated from the hue above, and rarely gradually blending. Inhabits perhaps all India, with Ceylon, also China,\* and as Mr. Hodgson could scarcely but have met with it in the valley of Nepal, I take the following also to refer to it.

*Mus Caudator*, Hodgson; described in Horsfield's Catalogue of the Mammalia in the E. I. Museum, p. 144. "Above, chesnut-brown with a rufous shade, more clear and passing into reddish on the rump; underneath from the chin to the vent, with interior of the thighs, white, with a very slight yellowish shade. Muzzle rather sharp, ears proportionally long. Body and head, 5½ in. long; tail, in the prepared specimen, 6 in." (A young individual?) "Tail exceeding the body in length," Hodgson, *Ann. Mag. N. H.*, 2nd series, III. (1849) p. 203.

The *MUS PALMARUM*, Scherzer, from the Nicobar islands, probably belongs to this group.

*M. CINNAMOMEUS*, Blyth, *J. A. S.*, XXVIII. 294. "Like *M. flavescens*, but smaller, with proportionally longer tail and softer fur, of a fine bright cinnamon colour, with inconspicuous black tips, the under-parts white, which is abruptly divided from the cinnamon hue above. Length of head and body about 6 in., the tail 7¾ in., and

The ball of the outer toes rather less than half the distance from the front of the foot. Inhabits India." Dimensions not stated.

In the *Brit. Mus. Cat.* p. 109, specimens are recorded from Mexico and Bahia! Another is stated to have been received from India, on which the description was founded.

Dr. Kelaart gives a *MUS ASIATICUS*, Gray, with a note of doubt. "Head and body (of a full grown *enquete* female) 6 in.; tail 5½ in. Fur soft; above, pale brown mixed with black; sides, ashy-grey. Beneath, pure white, but not so defined as in *MUS RUFESCENS* (*flavescens*, Elliot); tail rather thin, shorter than the head and body. Ears large, slightly villous. Limbs slender. *Geographical distribution*, India, Ceylon."

In Dr. Kelaart's *Prodromus Faunæ Zeylanicæ* we have *Mus flavescens*, Elliot (syn. *M. rufescens*, Gray, and *M. rufus*, Elliot), with var. *rufo flavescens* (syn. *M. tetragonurus*, Kelaart); also var. *Kandianus* (syn. *M. Kandianus*, Kelaart); and *M. nemoralis*, Blyth (erroneously described, syn. *M. arboreus*? apud Kelaart). Specimens of all these were received in the Society's Museum from Dr. Kelaart, and may be positively referred to *M. RUFESCENS*, Gray, (apud Gray). It is therefore useless to quote his descriptions; but he also sent the true *M. nemoralis*, nobis, of which I take his "small house Rat of Trincomali" to be a grown example.

\* We have a Chinese specimen, presented by R. Swinhoe, Esq.

hindfoot  $1\frac{1}{4}$  in." Two specimens received from the late Major Berdmore, of Schwe Gyen, on the Sitang river, which separates Pegu from Martaban. The upper parts of this species are as brightly coloured as in the British Dormouse (*MYOXUS AVELLENARIUS*), or scarcely less so.

*MUS NIVIVENTER*, Hodgson, *J. A. S.*, V. 234; *Ann. Mag. N. H.*, XV. (1845), p. 267, a house Rat. Proportions and characters of the last [*rattoides*], but tail rather shorter, and long piles of the pelage rarer. Size less. Above, blackish brown, shaded with rufous; below, entirely pure white, tail and all. Snout to vent  $5\frac{1}{4}$  in.; tail 6 in.; weight 4 to 5 oz., of rare occurrence in Nepal.\* Col. Tytler brought two specimens in spirit from Masuri, which I have considered to be this, and have noticed in *J. A. S.*, XXVIII. 295, as "a well marked species, rather larger than as originally described." A male measuring 6 in. long, with tail 7 in., and hind-foot nearly  $1\frac{1}{4}$  in., female even larger or 7 in. long, with tail  $7\frac{1}{2}$  in. Two specimens, from Landour, I have supposed to be of this race; but they are very like *M. RUFESCENS*, only with coarser and sub-spinous fur of duller colouring, and the minute setæ on the tail are dusky-brown.†

*MUS ROBUSTULUS*, nobis, *J. A. S.*, XXVIII. 294; also *M. RUFESCENS*, Gray (?), *var ? ibid.*; and (I suspect) *M. RUFESCENS*, auct. of Burma and Penang, auctorum: *M. rattus*, brown *var.*, apud nos, *J. A. S.*, XVII. 559 (?) perhaps also *M. Berdmorei*, nobis, *J. A. S.*, XX. 173. The common Rat of Lower Pegu and the Tenasserim provinces, taken about houses at night, but I think not a burrower. The description of *M. ROBUSTULUS* was taken from a particularly fine specimen preserved in spirit; much like *M. RUFESCENS*, but the upper parts are darker and less rufescent, and the tail about equals the head and body in length. One example procured in the vicinity of Calcutta, or perhaps this should rather be regarded as a variety of *M. RUFESCENS*.

\* In *J. A. S.* V. 234, it is thus described "Above, saturate black-brown; below, pure white, tail considerably longer than the body, and pale on the inferior surface."

† "Dark brown; the cutting teeth very narrow and slender; hind-feet slender. Length of head and body,  $6\frac{1}{4}$  in." (Gray, in *Cat. of Mr. Hodgson's mss.*) Probably, therefore, not the same as the above; the fore teeth of the usual breadth, and the hind-foot measures  $1\frac{1}{4}$  in. (..... ?)

● *M. Berdmorei* is thus described—"Length about a foot, of which the tail is not quite half. Ears posteriorly  $\frac{3}{8}$  in. Hind-foot  $1\frac{1}{8}$  in. Fur shortish, even coarse and hispid, but not spinous, of one quality, with no long hairs intermixed. Its colour grizzled grey, [dull brown] above, unmixed with rufous, below and on the feet, white. Rodentia tusks white. Tail rather more copiously clad than usual with long hairs." (E. B.) We have three specimens from Mergui, neither of which accords well with either of the others. One bad skin is decidedly *M. robustulus*; that of *M. Berdmorei* has peculiarly hispid fur; and the third (entire in spirit) has dark upper-parts and very white lower-parts, also smaller front-teeth.

*MUS NITIDUS*, Hodgson, *Ann. Mag. N. H.*, XV. (1845), p. 267. "Distinguished for its smooth coat or pelage, wherein the long hairy piles are almost wanting. It is a house Rat, like *M. NIVIVENTER*, but much rarer, and frequents the mountains rather than the valleys. Structure nearest to *rattoides*, and colour very similar to that or dusky brown above and dusky-hoary below. Long piles  $1\frac{1}{8}$  in. long; basally horny, apically black. Short piles cinereous below, with pale rufous tips. Snout to vent  $6\frac{1}{2}$  in.; tail  $7\frac{1}{4}$  in.; head  $1\frac{1}{8}$  in.; ears  $\frac{3}{8}$  in.; palma (with nail)  $\frac{1}{8}$  in.; weight  $3\frac{1}{2}$  oz." We have several specimens of what I take to be this Rat from Darjiling: they are especially distinguished by the fineness and softness of the fur. One specimen only of eight, from Darjiling, which I refer to this species has the lower-parts pure white, abruptly defined; but it is obviously of the same species as the other, and one supposed *MUS RUFESCENS* from China (*J. A. S.*), seems really not to differ, except in being not full grown.

*MUS HORIETES*, Hodgson, *Ann. Mag. N. H.*, XV. (1845), p. 268. "Dwells in houses and out-houses. A small land species with fine pelage, and no peculiarity of physiognomy or proportion. Tail longer than the animal. Colour above, sordid brown; below, sordid white. Snout to rump 4 in.; tail  $4\frac{1}{2}$ ; head  $1\frac{1}{2}$ ; ears  $\frac{1}{8}$ ; palma  $\frac{1}{2}$ ; planta  $1\frac{1}{2}$ ." Hodgson.

*MUS FULVESCENS*, Gray, Catalogue of Mr. Hodgson's specimens, p. 18. "Fur pale fulvous, hair very soft, lead coloured, with yellow tips, and interspersed slender black bristles; throat, belly beneath, pure white; tail elongate, nearly bald; cutting

row; skull about 1 in., 2 lin.; hind-feet about 1 in." (Gray). No other measurements given! "Nepal."

*MUS ŒQUICAUDALIS*, Hodgson, described in Horsfield's Catalogue, p. 144. "Pure dark brown above, with a very slight cast of rufescent in a certain aspect; underneath, from the chin to the vent with interior of the thighs, yellowish-white. Ears nearly an inch long; head proportionally long. Dimensions from the snout to the root of the tail,  $8\frac{1}{2}$  in.; tail in the living animal, equal in length to the body; head  $2\frac{1}{4}$  in." (Hodgson.)

Of all of the foregoing species or races described by Mr. Hodgson, carefully prepared specimens are most acceptable; and residents in the hill-stations should be able to identify at least some of them, and so help to elucidate such distinctions as may really exist among them.

*MUS COMCOLOR*, nobis, *J. A. S.*, XXVIII. 295 (the young); and *M.* (unnamed), p. 294 *ibid.*, (the adult). Common small thatch Rat of Pegu and Tenasserim provinces. This species conducts from the long-tailed Arboreal Rats to the ordinary house Mice. Certain Arboreal Mice that are diminutives of the former constitute the *VANDELEURIA* of Gray *Ann. Mag. N. H.*, X. (1842), p. 265: such are—

*MUS OLERACEUS*, Bennett, *P. Z. S.* 1832, p. 121: *M. oleraceus et (olim) longicaudatus*, Elliot; *M. dumeticola*, Hodgson, and the young (?), *M. povensis*, H., *Ann. Mag. N. H.*, XV. (1845) 268-9, also *M. dumecolus*, Hodgson, (undescribed). Length about or nearly 6 in.; tail 4 to  $4\frac{1}{4}$  in.\* Of a bright pale chesnut hue; below, white. "Constructs its nest of oleraceous herbs in the fields." (Sykes). Specimens from Asám and from the Deyra Doon are absolutely similar to others from S. India; and as Hodgson's descriptions of a Nepalese Mouse also accord, I infer that his species differs in no respect. "Tenants woods and coppices." (Hodgson).

*MUS BADIUS*, Blyth, *J. A. S.*, XXVIII. 295. Like *M. OLERACEUS*, but the eye fully twice as large, and black whiskers; colour of the upper-parts a more rufous chesnut or cinnamon hue; of the lower-parts white, almost pure. Length of a female 3 in. to base of tail; the tail  $4\frac{3}{8}$  in.; and hind-foot  $\frac{5}{8}$  in. Received from Schwe Gyen.†

A Deyra Doon example in spirit measured  $2\frac{1}{4}$  in., with tail  $4\frac{1}{4}$  in.

a small rufous Mouse in spirit, which I suspect is from Kashmir, trans-Himalayan. I cannot distinguish it from *M. MINUTUS*, Pallas (White, &c.), also in spirit from England.

*MUS GLIROIDES*, Blyth, *J. A. S.* XXIV. 721. "This has very much the aspect of the British Dormouse (*MYOXUS AVELLANARIUS*) ; but what little remains of the tail of the only specimen sent is nude, and the colouring is much less bright, though inclining to the same hue. It would seem to represent a very distinct division of the genus *MUS* ; but the specimen is evidently young, and more and better examples are needed for a satisfactory examination. Fur exceedingly dense and fine, nearly  $\frac{3}{8}$  in., long upon the back, and of a light brown colour tinged with fawn externally, the piles dusky-ash for the basal two-thirds or more ; lower parts white, very faintly tinged with fawn ; the white purest about the lips and chin : whiskers long, copious and fine (like those of *MYOXUS AVELLANARIUS*) : feet large and clad scantily with white hairs ; but a distinct dark brown mark upon each hind-foot, reaching almost to the division of the toes : ears rather small, ovoid and naked. Length of head and body 2 in. ; tail — ? ; ears posteriorly  $\frac{1}{8}$  in. ; and tarsa  $\frac{1}{8}$  in." From Cherra Punji.

*MUS PEGUENSIS*, Blyth, *J. A. S.* XXVIII. 295. "A field Mouse with tail longer than the head and body, well clad with hairs that become longer to the end. Length to base of tail  $3\frac{1}{8}$  in. ; of tail  $3\frac{7}{8}$  in. ; ear-coach  $\frac{1}{2}$  in. ; and hind-foot  $\frac{3}{4}$  in. These are the measurements of a female in spirit. A stuffed male has the tail (vertebræ)  $4\frac{1}{2}$  in. Fur very full and dense, pale fulvescent olive-brown on the upper-parts, slightly yellowish-white below : whiskers remarkably long." Not much unlike *M. SYLVATICUS* in appearance, but the tail longer and very conspicuously hairy towards the end, indeed more so throughout than in any other mouse I know of, as especially seen when held up to the light ; but it does not appear to be specially akin to the *HAPALOMYS LONGICAUDATUS*, nobis, *J. A. S.* XXVIII. 296. Both were received from Schwe Gyen, on the Sitang river.

The series next following consists chiefly or wholly of house Mice.

*MUS URBANUS*, Hodgson, *Ann. Mag. N. H.*, XV. (1845), p. 269 : *M. dubius* (?) H., *ibid.* p. 268 : *M. musculus* apud Elliot et Kelaart : *M. mami*, Gray (undescribed). "The common house Mouse of India generally, with Ceylon. Species usually found in the city of Kat

Of the diminutive species from China noticed in *J. A. S.* XXIX. 90, the men has been lost or mislaid by one of our taxidermists, to whom I skin to be mounted,

mandoo: allied to *dubius* in its proportions and colours, and possibly *dubius* may be the immature. Above, embrowned ruddy-luteous, below, luteous, more or less rufescent. Feet paler. Snout to rump  $2\frac{3}{4}$  in.; tail  $3\frac{3}{4}$  in.; head  $1\frac{1}{8}$  in.; ears  $\frac{9}{16}$  in.; palma  $\frac{3}{8}$  in.; planta  $\frac{3}{8}$  in.; weight  $\frac{1}{2}$  oz." (Hodgson).\* "On comparing fine specimens of the common English mouse in spirit with equally fine examples of the Indian house mouse, it is seen that *M. MUSCULUS* has conspicuously larger ears, much smaller eyes, broader paws, and the tail is one-fourth shorter, measuring 3 in., in *MUSCULUS* and 4 in. in *URBANUS*. The fur again is of very different texture," *J. A. S.* XXVIII. 296. This animal has been received from Port Blair, where doubtless recently introduced.

*MUS HOMOURUS*, Hodgson, *Ann. Mag. N. H.*, XV. (1845), p. 268. *M. Nipalensis*, H., *J. A. S.* X. 915, (undescribed). "The common house mouse of the Himálaya hill-stations, from the Panjáb to Darjiling." "Distinguished by a tail equal to the animal, being usually quite equal, but sometimes rather less. Coloured like *DECUMANUS* but purer, or rufescent brown above, and rufescent white below. Hands and feet fleshy white. Snout to rump  $3\frac{1}{2}$  in.; tail  $3\frac{1}{2}$  in.; head  $1\frac{1}{8}$  in.; ears  $\frac{9}{16}$  in.; palma —?; planta —?; weight  $\frac{3}{4}$  oz. It has eight teats only in the females? The other Mice have ten and the Rats twelve." (Hodgson). "As compared with the European *M. MUSCULUS*, the fur is much more Gerbille-like in character, the piles less dense and sinuous." (*J. A. S.* XXVIII. 295.)

*MUS CRASSIPES*, Blyth, *J. A. S.* XXVIII. 295. "Like the preceding, but with the tail rather longer than the head and body. Length  $2\frac{3}{4}$  in., tail  $3\frac{1}{4}$  in.; hind-foot  $\frac{3}{4}$  in." "The feet particularly large, and, like the tail, well furnished with coarse short setæ. From Máswei." Described from a specimen in spirit belonging to Col. Tytler.

*MUS TYTLERI*, Blyth, *J. A. S.* XXVIII. 296. "Length  $2\frac{3}{4}$  in.; tail the same (having about 24 vertebrae). Fur unusually long and full, of a pale sandy mouse colour above, isabelline below, and pale on the well clad limbs and also on the tail laterally and underneath. Whiskers exceedingly fine in texture, and of a whitish colour. Male

\* *M. dubius*, H., "a house Mouse, but also found in out-houses and gardens allied to *domesticola* [oleraceus] by its long tail. Above, dusky brown, with fawn; below, sordid fawn. Snout to rump  $2\frac{1}{4}$  in.; tail 4 in.; head  $\frac{3}{8}$  in.; weight 2 oz." (Hodgson.)

"*Dom Deyra Doon*," also described from a specimen in spirit belonging to Col. Tytler.

*MUS BACTRIANUS*, Blyth, *J. A. S.* XV. 140. "Presents a very close approximation to *M. MUSCULUS* in size, proportions and structure, inclusive of the conformation of the skull; but the fur is much denser and longer, and its colouring absolutely resembles that of a pale specimen of *GERBILLUS INDICUS*, except that there is no whitish about the eyes, nor is the crown of a deeper hue, and the tail is thinly clad with short pale hairs to the end.\* \* \* The entire under parts and feet are white; and the upper-parts light isabelline, with dusky extreme tips to the hairs, and their basal two-thirds deep ashy." (B.):—The common house Mouse of Kandahar; but the house Rat is, I believe, unknown there: at least so all my informants agreed in stating, and I certainly never saw one, although for two years I was in charge of extensive grain godowns, which would naturally have attracted them had any existed." (Hutton.) Syn? *M. gerbillinus*, nobis, *J. A. S.* XXII. 410, and *M. Theobaldi*, nobis, *J. A. S.* XXII. 583.

*M. gerbillinus*. Entire length of male 5 in., of which the tail is  $2\frac{7}{8}$  in. Hind-foot  $\frac{3}{4}$  in., ear-conch barely  $\frac{1}{2}$  in. Female rather smaller. Fur of mean length, of a sandy-brown colour on the upper-parts, white below and on the limbs, which latter have a faint tinge of the colour of the back. About twenty-five caudal vertebræ. Tail thinly clad with minute setæ." From Pind Dadun Khan.

*M. Theobaldi*. "Like *M. gerbillinus* [*BACTRIANUS*], but larger, with comparatively shorter tail and larger feet. Dimensions of an adult female—Length of head and body  $2\frac{7}{8}$  in.; tail  $2\frac{5}{8}$  in.; ears  $\frac{1}{2}$  in.; tarsæ and toes  $\frac{1}{2}$  in." From Kashmir.

*M. NITIDULUS*, Blyth, *J. A. S.* XXVIII. 294. "A house mouse apparently, with tail equal to the head and body, and uniformly furnished with minute setæ to the end; ears large and ample. Total length  $6\frac{1}{2}$  in.; hind-feet a little exceeding  $\frac{3}{4}$  in.; and ears (posteriorly)  $\frac{3}{8}$  in. Colour nearly that of *M. DECUMANUS*, with the under parts subdued white tolerably well defined. Of the same subgroup as *M. MUSCULUS*\* and *M. URBANUS*," but with the front-teeth conspicuously larger. Received from Schwe Gyen, on the Sitang river

\* Perhaps *M. MUSCULUS* (?), L., apud Cantor, from Penang; *J. A.*  
"In colours, this slightly differs from the European Mouse, the



*MUS CUNICULARIS*, Blyth, *J. A. S.* XXIV. 721. "A small field (?) mouse remarkable for its ample ears, and tail shorter than the head and body. Length of head and body  $2\frac{1}{2}$  in.; of tail  $2\frac{1}{2}$  in.; ears posteriorly  $\frac{1}{2}$  in.; and hind-foot  $\frac{1}{2}$  in. Colour of a wild Rabbit (*LEPUS CUNICULUS*); above, below white; and the feet with brownish hairs above, but with white hairs upon the toes: tail conspicuously ringed, the setæ minute and inconspicuous." From Cherra Punji.

*MUS DARJEELINGENSIS*, Hodgson, described in Horsfield's Catalogue. "Above dusky brown with a slight chesnut reflection; underneath pale yellowish white. Snout to vent 3 in.; ears long; tail  $2\frac{1}{2}$  in. Proportions of body, tail and extremities, comparatively slender." (Horsfield).

*MUS ERYTHROTIS*, Blyth, *J. A. S.* XXIV. 721. "Another and very different form of mouse from [*M. GLIROIDES*], and equally from the common house mouse. Length of head and body  $2\frac{1}{2}$  in.; tail  $2\frac{3}{4}$  in.; and consisting of about 26 vertebræ: ears small and hairy,  $\frac{1}{2}$  in., long externally: hind-foot and claws  $\frac{1}{2}$  in. Fur long and very dense; of a rich dark brown colour, grizzled, and brightly tinged with rufous or rufo-ferruginous towards the tail and upon the ears conspicuously: lower parts albescent, tinged with fawn: feet with brown hairs upon their upper surface; and the tail considerably hirsute. From Cherra Punji.

The ordinary field Mice of India have the tail shorter than the head and body, the fur not spinous, and white or pale lower parts abruptly separated from the colour of the back. Such are—

*MUS INFRALINEATUS*, Elliot, *M. S. M. Ellioti*, Gray, (undescribed, nec *Golunda Ellioti*, Gray,) *Br. Mus. Catal. Mamm.*, p. 110. The largest of the group. Length about 5 inches; and tail  $4\frac{1}{2}$  in.; hind-foot  $1\frac{1}{8}$  in. Light fulvous brown above, white below, with a mark on the chest of the colour of the upper parts. From S. India.

being a mixture of shining grey and tawny. The separate hairs are leaden grey at the base, then tawny with black apex; some are longer and uniformly dark brown. Beneath, pale ash. The ears are larger, more than half the length of the head, with very short hairs, rounded, blackish. Toes, palms, and soles, whitish. Tail slender dark grey, with very short adpressed brown hairs. Length of head and body  $2\frac{3}{4}$  in.; tail  $2\frac{1}{2}$  in." (Cantor).

I had missed our solitary specimens of *M. NITIDULUS* and of *M. GLIROIDES*; I chanced to find the former in a bottle containing Kandyan examples of *SCENS*! No doubt some one had broken the bottle, and said nothing but a trick not wholly new to my experience in the Society's Museum.

\* *MUS CERVICOLOR*, Hodgson, *Ann. Mag. N. H.*, XV. (1845), p. 268; *M. albidiventris*, Blyth, *J. A. S.* XXI. 351. "Distinguished by its short tail. Above dull fawn, below sordid white. Lining of ears and extremities pale. Snout to rump  $3\frac{1}{2}$  in.; tail  $2\frac{7}{8}$  in.; head 1 in.; ears  $\frac{9}{16}$  in.; weight  $\frac{3}{4}$  oz. Females less and having ten teats," (Hodgson). Length of a large male  $3\frac{1}{4}$  in.; of which the tail is  $2\frac{3}{4}$  in.; tarsi to tip of claws  $1\frac{1}{8}$  in.; ear (from anterior base),  $\frac{9}{16}$  in. Nepal; Bengal (vicinity of Calcutta); Malabar.

*MUS FULVIDIVENTRIS*, Blyth, *J. A. S.* XXI. 351: *M. cervicolor*?, Hodgson, apud Kelaart, *Prod. Faunæ Zeyl.*; p. 64. "Length about  $2\frac{3}{4}$  in.; tail (vertebræ)  $2\frac{1}{2}$  in.; tarsi to tip of claws  $\frac{5}{8}$  in. Colour of *M. SYLVATICUS* above the fur shorter and less fine (as in its various Indian affines), lower parts rufescent or isabelline, or they may be described as a pale weak ferruginous. Twenty caudal vertebræ distinguishable, with  $\frac{1}{4}$  in. additional of tail-tip." (E. B.) From Ceylon. "Found in houses in 'Trincomali.'" (Kelaart).

*MUS STROPHIATUS*, Hodgson, *Ann. Mag. N. H.*, XV. (1845), p. 268. "A field mouse closely allied to *M. CERVICOLOR*, but seemingly distinct. Bright fawn above, pure white below; a cross or gorget on the breast. Snout to vent  $3\frac{1}{8}$  in.; tail  $2\frac{7}{8}$ ; head less 1; ears  $\frac{9}{16}$  in.; weight  $\frac{1}{2}$  oz." (Hodgson.)

*MUS TERRICOLOR*, Blyth, *J. A. S.* XX. 172. "This much resembles *M. LEPIDUS*, Elliot, in form and colour, but the face is very much shorter, and the fur short, soft, and not spinous in the least degree. Its colour varies, however, according to the soil; those of the alluvium of the Ganges being darker than specimens from the ferruginous soil to the westward. All have the under-parts white, abruptly separated from the hue of the upper-parts, and in the various affined species. Length  $2\frac{1}{2}$  in.; of tail  $2\frac{1}{8}$ ; ears  $\frac{1}{4}$ ; hind-foot  $\frac{9}{16}$  in. Inhabits gardens and is very numerous in the open fields; together with *GERBILLUS INDICUS* and *MUS INDICUS*." (E. B.) The most common field and garden Mouse in Lower Bengal. I found it very abundant in the Santál districts westward of Midnapore.

Allied to the foregoing are certain spine-clad field Mice which have been designated *LEGGADA* by Dr. Gray, (*M. N. H.*, I., 1837, p. 5

*L. SPINULOSA*, Blyth, *J. A. S.* XXIII. 734. "Nearly affine *M. PLATYTHRIX*, Sykes, but of a dark dusky colour above, with

vous tips to the softer fur: below and all the feet [dull] whitish. Upper rodential tusks orange, the lower white. Whiskers long and fine, the posterior and longer of them black for the basal half or more, the rest white. Length of adult male (in spirit)  $3\frac{3}{4}$  in.; tail 3 in. (about, the extreme tip wanting in the specimen); planta  $\frac{7}{8}$  in." (E. B.) From the Punjab, and specimens since received from S. Malabar, (*J. A. S. XXIX. 3.*) are quite similar, unless rather larger, and there is little difference in the colour of the upper and lower tusks.

L. JERDONI, Bl., *n. s.* Bright dark ferruginous above, pure white below; some fine long black tips intermingled among the spines of the back: limbs marked with blackish externally; the feet white. Length about 4 in.; tail  $3\frac{1}{2}$  in.; hind-foot  $\frac{7}{8}$  in. Procured in Sikhim by Dr. Jerdon.

L. PLATYTHRIX; *Mus platythrix*, Bennett, *P. Z. S.* 1832, p. 121; *M. saxicola*, Elliot, *MSS.* Light sandy brown, white beneath; the flat spines less developed than in the two preceding species. Length  $3\frac{1}{2}$  in.; tail  $2\frac{1}{2}$  in.; hind-foot  $\frac{3}{4}$  in.; S. India. *Vide* Elliot in *Madr. Journ. Lit. Sc. X.* (1839), p. 215.

● LEPIDA; *Mus lepidus* Elliot, *Madr. Journ. L. Sc. X.* 216: *L. booduga*, Gray, *M. N. H.*, I. (1837), p. 586. Similar to the last but smaller, and but weakly spinous. "The dimensions of an old male were—length of head and body  $2\frac{9}{16}$  in.; tail  $2\frac{7}{16}$  in.; hind-foot  $\frac{6}{16}$  in." (Elliot). *Vide loc. cit.* S. India. "Inhabits India, Bombay. They live in pairs in the black soil, making little burrows, in which they produce two or three young." (Gray.) The colour of this small mouse would rather indicate that its abode was in a pale sandy soil. Mr. Elliot writes—"Lives generally in pairs in the red soil," &c.

Another type has been designated GOLONDA by Dr. Gray, in *M. N. H.*, I. (1837), p. 586. "The grinders, when perfect, low, with a broad flat crown; the cross-ridges of the crown of the upper grinders divided into three distinct slightly raised tubercles. Rat-like Mus."

G. ELLIOTI, Gray, *M. N. H.* 2nd series, I. (1837), p. 586, (*nec mus Ellioti*, Gray, *Br. Mus. Cat.*). "Fur pale brown, with minute, slender, hair-pointed black tips. Chin, throat, and beneath, Under fur paler. Teeth yellow; upper cutting teeth groov-

ed in front. Ears covered with short hair. Inhabits India, Bombay." No dimensions given!

SYN. *Mus hirsutus*, Elliot; the *Gulanli* of the Canarese. "About the size of *M. lanuginosus*, or a little larger,—but differs in living entirely above ground, in a habitation constructed of grass and leaves, generally in the root of a bush at no great height from the ground, often indeed touching the surface. The head is longer than that of the *Mettade*, but the muzzle is blunt, rounded, and more obtuse, and covered with rough hair. The face and cheeks are also rougher than those of other Rats; the ears round and villose, the eyes moderate; the whiskers long and very fine. The colour is an olive-brown above, mixed with fulvous; beneath yellowish-tawny; sometimes paler, or light yellowish-grey.

"A male *Golunda* measured—length of body  $6\frac{1}{2}$ , of tail  $4\frac{3}{8}$ ; of head  $1\frac{1}{8}$ ; of ear  $\frac{5}{16}$ , weight nearly 3 oz."

For habits, *vide* Elliot, *loc. cit.*

A number of specimens in spirit presented to the Society's Museum by Mr. Elliot are considerably smaller, though appearing to be adult, and a female is sent with its born young; these accord, however, precisely with the 'Coffee Rat' of Ceylon, as described by the late Dr. Kelaart. He presented the Society with a specimen which is unquestionably identical in species with Mr. Elliot's specimens sent by the latter to the Society's Museum.

G. COFFÆUS, *Mus coffæus*, Kelaart, *Prodromus* (1852), p. 67. "Head and body  $4\frac{1}{2}$  in.; tail 4 in. Fur thick, stiff; above, fulvous-brown, mixed with black; beneath, tawny-grey. Hairs of upper-parts, flattened, ashy-grey, tipped yellow, with some thinner and longer ones, also tipped yellow, with subterminal black band. Under fur soft, and of a light lead-colour. Face and cheeks rough. Ears moderate, subovate, villous; yellow-ferruginous. Tail round, tapering, scaly and villous; its upper surface dark brown—lower surface yellowish. Cutting teeth yellow. Upper ones grooved as in GERBILLUS.

"This is the Rat which [in Ceylon] is so destructive to coffee-trees. Whole plantations are sometimes deprived of buds and blossoms by these Rats. They are found in all the higher parts of the Kandian provinces. The attention of Europeans has only been drawn to them since coffee-planting commenced in the island. They appear to be migratory; and are not always seen in coffee estates; when they do visit the cultivated parts, their numbers are so that in one day more than a thousand have been known to on one estate. In clearing forests, the nests of these Rat

with under the roots of trees. We have not been so fortunate as to see many fresh specimens; only one was brought to us from Kaduganava: a premium is set by some coffee-planters on the heads of these rodents. The Malabar coolies are very fond of eating them roasted, or fried in oil."

G. MILTADA, Gray, *M. N. H.*, 2nd series, I. (1837), p. 586. "Length of body and head  $4\frac{1}{2}$  in. Fur very soft, mouse-coloured varied with black; chin, and beneath, whitish. Under-fur lead-coloured, with very numerous soft brown hairs having long black tips; of the belly white, with brownish tips. Ears large, hairy. Whiskers very slender, long. Tail shorter than the body, scaly, covered with short adpressed black hairs, hiding the scales. Feet pale; claws white. Inhabits Bombay. Lives in cracks in the black soil, in pairs; and are often crushed, when the rain, or cultivation, obliterates the cracks."

Syn. *Mus lanuginosus*, Elliot, *Madr. Journ. Lit. Sc. X.* (1839), p. 212. "*Mettade* of the Waddurs. The name adopted to designate this species is taken from the word *Mettade*, meaning soft, in allusion to its fur, which is fine and soft, *mettanu* meaning soft in Telegu. It is about half the size of *M. INDICUS*, which it somewhat resembles. The head is short, but the muzzle, instead of being square and truncated is sharp; the ears are larger in proportion and more ovate. The general form is not so stout. The tail is shorter than the body. The colour above is reddish-brown, with a mixture of fawn; lighter beneath, close and soft, with a few longer hairs projecting. A large adult male measured—length of body  $5\frac{2}{3}$  in.; of tail  $4\frac{2}{3}$ ; total  $9\frac{2}{3}$ ; of head  $1\frac{2}{3}$ ; of ear  $\frac{2}{3}$ . Weight  $2\frac{1}{2}$  oz."

For description of habits, *vide* Elliot, *loc. cit.* I have not yet seen this species.

G. NEWERA, Kelaart, *Ann. M. N. H.*, 2nd series, VIII. (1851), p. 339. Length of body and head  $3\frac{1}{4}$  in.; tail  $2\frac{1}{2}$  in. Fur soft, yellowish-brown varied with black; chin and beneath yellowish-grey; under-fur dark lead colour; soft long hairs on the upper parts of the head and body, with longer black-tipped hairs having a subterminal yellowish band; fur of belly dark lead-colour, tipped with yellowish-grey; ears large, hairy on both sides, of a light rusty or ashy colour; whiskers slender, moderately long, some greyish, others blackish; tail shorter than the body, tapering to a point, scaly; upper surface black colour and covered with short semi-adpressed black hair; lower surface yellow or ashy colour, covered with short hair of the same colour; feet having dark brown claws, purplish, four toes

to the fore-feet, with a clawless rudimentary thumb [as in all *muridæ*?] \* \* \* Incisors yellow, the superior grooved in the centre: molars flat, deeply 3-lobed, the tubercles rising in three distinct lines, middle larger than those of the sides, and the front one extending beyond the other lobes.

"This Rat is found in pairs in the black soil of Newera Ellia, and is a great destroyer of peas and potatoes. In the Ouva district, we found another soil Rat, smaller than the above, and of a pale ashy colour, which at the time we referred to *L. boodaga* of Gray, but having since lost the specimen preserved in spirit, we are not able to give a description of it. That it was very different from every other Rat here described [in *Prodromus*], we have no doubt."

Genus HAPALOMYS, Blyth, *J. A. S.* XXVIII. 296.

H. LONGICAUDATUS, Bl., *loc. cit.* Received from Schwe Gyen, on the Sitang river.

The reader has at length before him, without need of further research in books (so far as I can discover), an epitome of the long and perplexing series of Indian *Muridæ*, so far as the published descriptions of them can help him to identify any species that may fall under observation. In any part of India and the neighbouring countries, he might render useful service by collecting an adequate series of examples of the species procurable in the vicinity, both carefully prepared skins for mounting, and some entire specimens in spirit. Wherever found, these animals are, in general, obtainable in any quantity, from certain classes of natives who eat them, (or at least those inhabiting the jungles or open country,) and who are familiar with their haunts and habits. With really good and properly preserved specimens from different parts, and in sufficient number, the real species would soon be discriminated from the factitious, as indeed is already the case with a good many of them; and the latter would soon fall into the rank of synonyms, as by degrees one after another became identified and understood. It may not be a particularly inviting group to study, in the opinion of many observers and collectors; but it needs to be assiduously 'wrought out;' and the difficulty of reconciling the synonyms will be considerably diminished now that all the very numerous names and descriptions have collated in one continuous grand series.

*Notes on the distribution of Indian terrestrial Gasteropoda considered with reference to its leaning on the origin of species.—By W. THEOBALD, Jr.*

“There are more things in Heaven and Earth, Horatio, than are dreamt of in your Philosophy.”

I am led to make the following remarks on a subject of considerable interest, by some suggestions contained in a Paper by my friends the Messrs. Blanford, which appeared in the fourth number of the Journal of the Asiatic Society for 1861. This paper is I trust but one of many which we may receive from the same writers, and it is by such contributions alone that we can hope to arrive at sound and comprehensive views of the distribution of the animals of which it treats, which, from their often limited range within the tropics, and the marked and peculiar forms they there exhibit, afford peculiar facilities for estimating the amount of support, derivable from their study, which they afford to the ingenious theory of Mr. Darwin of the origin of species. In several respects indeed the problem of the distribution of land mollusca and the origin of both their generic and specific types, is less encumbered with subsidiary considerations, requiring special allowance and elimination, than the same problem as regard any class of the vertebrata, and the land mollusca therefore afford not only a simpler, but also a more satisfactory field for testing how far a theory, which may find plausible justification and analogical support from admitted physiological modifications among the vertebrata, is applicable to and in accord with our knowledge of the invertebrate classes.

With this view therefore it will be well to sift carefully a suggestion made in the above quoted paper, which does not appear to me to stand on any firmer foundation than mere hypothesis.

After tabulating the distribution of the Terrestrial Gasteropoda of the Kolamully, Putchamully, Kalryenmully and Shevroy ranges of hills, the authors arrive at the conclusion that the whole area is occupied by one and the same fauna, (referring of course to the mollusca only,) with which conclusion I fully agree, but this uniformity might about not by the dispersion of the same species over the area, but by the occurrence of the same species on ranges of

hills isolated from one another by tracts, in which, from physical causes, shells are absent; hence it is argued, that at the period these colonists attained their present quarters, very different physical features and conditions must have obtained over the intervening area, to what now exist. In support of this they appeal to the geological history of the Peninsula, on which point I in no wise differ from them, but it seems to me that no necessity exists for appealing to any such agency to explain the distribution above mentioned, and that moreover it is utterly and beyond expression inadequate to promote the results attributed to it.

In a former paper I alluded to the existence of several distinct Indian Provinces of land mollusca, to which very few shells are common, and it is not less suggestive than singular that among the few shells common to two or more Indian Provinces, some of them trespass far beyond the geographical limits of India, even as far as Africa, Mauritius, &c. Now it is sought to be argued, that because some few shells such as *Helix Huttoni*, B., *H. Similaris* Fér., *H. Castra* B. *Bulinus punctatus*, Anton, and some others, have a very wide range, that they must have migrated, inch by inch, over all the intervening space, or must have availed themselves of such means of conveyance as a conveniently submerged country, or the reverse of such a condition, as supposition demands, afforded.

A geologist certainly is not easily staggered by any considerations involving a mere question of time, but I confess that to me, more than ordinary difficulty seems to be involved in the supposition of the case of these living travellers, restlessly diffusing themselves as though urged on by the furies of Orestes, or propelled by the desire of possessing the fairer pastures of a far off land. The migratory instinct of birds certainly offers an instance of an irresistible and spontaneous impulse from within to seek other climes, but I am aware of no facts which would lead us to suppose that any similar instinct or stimulus is implanted in the invertebrate classes, which would ensure or conduce to their dispersion. In such cases too, as Mr. Darwin suggests, (*Origin of Species*, page 397,) the means of transport afforded by winds and waves, is quite independent of any voluntary effort on the part of the animal, who, for many a weary day or week, must have concentrated its energies to retaining hold of its straw or stick. The ability of a small *Helix* being carried uninjured round th



wedged in a cleft stick or cemented to a bough, I fully admit, but not if the animal was exposed to the moist sea air, not to say immersed in either fresh or salt-water, as such a condition would certainly provoke its dormant vitality and lead to its destruction ; and it must be remembered, that the period when shells are most liable to be carried down by streams, is just the time when they are most active and unlikely to be hermetically fastened to their hot-weather roosting-places : the method of diffusion therefore of shells on floating wood, I must, though of course opinions will differ, regard as strained and improbable even as an exceptional case.

Equally difficult is it to realize the dispersion by the accidental method of the freshwater shells of India, enjoying as they do a far wider range than the terrestrial races, though they must be less fitted than any land shell for transmission across a submerged country. Birmah for example possesses its own peculiar Uniones, but many Indian freshwater shells (including *Unio ceruleus* and *U. marginalis*) range over Birmah also, though it will hardly be contended that these shells navigated the salt seas on sticks, or ploughed their way inchmeal over every water-shed between the Indus and Irawadi ; neither is it easy to say, if such means were really subservient to the diffusion of the wide spread species, how the peculiar or local species which are the most numerous, did not come to extend their range in like manner. Indeed it seems to me an inevitable conclusion, if we admit the potency of accidental transmission to extend the range of a species, that no such thing as a local fauna, possessing a special facies and circumscribed limit, could exist, or at the most that such a limitation of species among the mollusca would be the exception and not the rule, which our knowledge of the distribution of Indian mollusca, (to confine myself to my topic,) emphatically disproves. With whatever theory we associate the fact, few will deny that all animals have a definite range in space, no less than in time, and which is not the less a reality, because it is capable of extension or mutation under the influence of physical conditions, just as the normal life of an animal may be prolonged or curtailed by the conditions by which it is surrounded ; and as some genera enjoy a far larger range in time than others in the vista of the past, so some genera and species are far more spread as regards space than others, whose restricted areas shrank as it were in the domain of their numerically in-

The widely diffused species are not individually so numerous as to favour the idea of their extended range being the result of a vivacious *debâcle* of individuals overflowing from the cradle of their species: indeed most of the more restricted species are fully as numerous or more so within their own area, than those whose area is one hundred times larger: we must, therefore, I think, reject the idea of their diffusion being either the result of accidental transmission, vagabond instincts, or numerical pressure of individuals. Some of the suggested methods indeed of explaining the subject, do not seem greatly to differ in kind or credibility from the nursery machinery of the blue bag and the parsley bed, with which crones are wont to satisfy the curiosity of troublesome juveniles, regarding the antecedents of the little stranger who is occasionally incorporated in the family circle. The whole question in fact of the distribution of animals hinges on the origin of species, anything throwing light on one, helping equally to elucidate the other, and here my own views differ from those of my friends, the Messrs. Blanford. If it can be established that all animals are descended from a single pair, whose descendants radiate from their own little Ararat and that the world was replenished with life from a point, then all the fine arguments that can be adduced against the feats of navigation and travel, performed by these tiny sailors under trying circumstances, fall to the ground before the plain deduction, that however the deed was accomplished, accomplished it has been; but till the fact is established, or unless we shackle ourselves by an assumption, known facts seem to favour the idea of a plurality of archetypal pairs, and their sporadic distribution, (as the *ethnic centres* of the human races,) over the specific area, proportionately to its extent. Ample room would still be left under this supposition, for extensive migration of the animals themselves, and for the enlargement or contraction of their area, even to the entire change of its original site, under pressure of changed conditions and such surface revolutions as many species must have been subjected to. Such changes, however, of distribution must have ever constituted the exception, and are probably confined to a few, and those few widely spread species; and to apply the argument in favour of all, that may be admissible with a few, appears rather opposed to, than supported by, the most liberal interpretation of facts. The inherent weak point in the theory of distribution of species, is the same as the weakest point of

gin of Species,—the unlimited application of facts which have but a limited bearing. It is as though any one should argue, that because a man may live to 20 years or 40 or 80, therefore he may live to 160. Migration of species as well as individual changes may take place, but to these there are limits not the less impassable, because not sharply defined. Many of our domestic animals are as artificial creations as our 8-day clock, but their variation from the focal stock, though considerable, and ill-defined in its limits, is subject to certain bounds; and I cannot see that from these known deviations, it is logical to argue unknown deviations, such as no sick man ever dreamed of: or that a bear, though the breeder might in time lengthen his nose or shorten his claws or fur, could ever suffer a sea change and cleave the deep like a whale, any more than he could scale the heavens like a cherub. The idea *may* be philosophical but it *is* absurd.

Those who reject the idea of original or archetypal pairs of all animals in favour of the theory of “natural selection,” must embrace the same views regarding the method of their distribution, as those who hold every animal to have radiated from Mt. Ararat, as lineal descent is the Ariadnean thread whereby they seek to solve the mystery of the “parsley bed,” but though this theory certainly shifts the difficulty a long way off, yet it by no means disposes altogether of the necessity of a primordial “*blue bag*” of some sort or another, as none of its adherents, that I am aware of, have advanced any refutation of the accepted aphorism.

“gigni

“E nihilo nihil, in nihilem nil posse reverti.”

It is clearly essential for those who support the natural selection theory, and regard species as merely pronounced or rigorous varieties springing from the same stock, to establish the efficacy of transport or migration, to bring about the distribution of all animals within their respective areas: hence the variety of means suggested for that end, most of which seem, to say the least of it, far fetched and improbable. Earth, ocean, and the winds of Heaven are taxed in turn to afford means of transport for widely diffused species; hence the interest attaching to a careful study of the distribution of the mollusca, affording serious grounds for doubting some of the conclusions the theory necessitates, and the light which it is likely to afford to enquirers. But to return to the more immediate subject of re-  
the diffusion of terrestrial mollusca over their individual area

To account for the diffusion of the descendants of a single pair, two modes are usually suggested as adequate, viz., voluntary migration of individuals, and their fortuitous transport on floating logs or lesser vehicles over the watery waste. Now the spontaneous migration of animals can only be brought about by the operation of two causes,—a natural instinct such as regulates the movements of migratory birds, the operation of which we may safely dismiss from our present calculations, or the necessity for seeking more abundant supplies of food, or of avoiding unsuitable physical conditions. In the case, however, of the invertebrata we are considering, the second cause can have but little more effect than the first in stimulating their movements, as we know of no migratory hosts of snails, compelled by dearth of food to shift their quarters, or of any who adopt any other mode than torpidity to escape the prejudicial effects of either extreme heat or cold : representing therefore the results of migration as  $x$ , we may safely conclude that  $x = 0$ . There still remains the very varied, and as it is usually deemed, efficacious mode of accidental transport by winds and waves through the agency of floating wood and the like. Certainly a complete list of all the terrestrial shells which have trusted their lives to floating wood since the days of Adam, would, maugre its small size, prove a formidable difficulty for me to dispose of, and I am prepared to admit that many cases of dispersion by accidental agencies may have occurred, and to give the full weight to this cause, which I think it is fairly entitled to ; but it is not to explain an occasional or exceptional case, that the power of floating wood is invoked, but to account for the general diffusion of individuals throughout the area of the species, and this, as I have before remarked, seems utterly disproved by great numerical preponderance of species enjoying very restricted areas, (most strikingly so among the operculata,) a few only overrunning the boundary of the province in which they occur, and of these which do so, some extend their range far beyond any strictly Indian Province. To illustrate this more forcibly, I give a tabular statement, exhibiting the distribution of the two most important families of terrestrial mollusks in India, viz., the Helicidæ and Cyclostomidæ ; prefacing it with a few words respecting the provinces, into which I conceive India and the adjacent countries may be divided. The provinces as now proposed depend in a great measure physical demarcation, and are therefore to some extent natural ;

sions, though they might, if regard were had solely to their (molluscos) fauna, be again subdivided, but I prefer the more comprehensive natural boundaries, as at once more intelligible and real.

It may be urged with some show of truth, that the altitude of a range or district, exercises a similar influence on its fauna, that a change of latitude does, and that consequently mere geographical divisions are arbitrary, unless consideration is also had to the modifying influence of the height of the country embraced within it, but whilst admitting that altitude corresponds in a manner, as far as climate goes, with latitude, and that similar faunas maintain a co-relation with either a certain latitude or corresponding altitude, yet it does not seem that these similar conditions give rise to specific identity as a result, thereby diminishing the significance of specific areas; but rather that such similarity of conditions permits of the presence of interlopers or stragglers from other areas, without such examples ever rising above the category of exceptional cases.

The six provinces which I think can naturally be established, are as follows :—

Province I.—The Himalayan, embracing the main and lower ranges of the Himalayas, together with the Khasi and Jynteah Hills.

Province II.—The central, embracing the plains of India, South of Province I. including and bounded by the valleys of the Ganges, Indus, Taptee and Godavery.

Province III.—The Southern, embracing Peninsular India, South of Province II.

Province IV.—The Birmese, embracing Arrakan, British and Independent Birma, the Tenasserim Provinces and adjacent Islands.

Province V.—The Cingalese.

Province VI.—The Germanic (in part), embracing Afghanistan and the Thibetan face of the Himalayas.

The Table given below exhibits the number of species of each genus of the Helicidæ and Cyclostomidæ in India, and the number of species which may be termed "*vagrant*," or which range beyond the limits of one or more provinces, but of course, when so many additions are being made yearly to the list of our Indian shells, this Table may be taken as illustrating a general proposition, and not as

having pretensions to absolute accuracy, as to the actual number of species described up to date. Some shells too, regarded by me as mere varieties, are by some esteemed species, so that if the latter view prove correct, a reduction would be effected in the number of vagrant species *e. g.* *Helix bistrialis* (*H. Ceylanica*,) and all additions will probably go to swell the numbers of species possessing a restricted area, rather than those of more extended distribution, so that the numbers given above are I think sufficiently correct, and the data ample enough as they stand, to support the proposition which I wish to establish, viz., that species which from their wide diffusion may be termed "*migratory*," are more aptly described as "*sporadic*" and that so far from the fact of their wide distribution being the result of a general law, or of certain universal conditions favourable to their dispersion, it is plainly an exception, and moreover, so very exceptional as to militate strongly against the idea of any law or conditions favourable to migration, ever having existed, so far as we may judge by results.

The following species are excluded from my list.

|                                           |   |                                               |
|-------------------------------------------|---|-----------------------------------------------|
| <i>Helix pullula</i> , <i>B. MSS.</i> ,   | = | <i>H. acris</i> , <i>B.</i>                   |
| <i>H. bombax</i> , <i>B.</i>              | = | <i>Streptaxis Petiti</i> , <i>Gould. juv.</i> |
| <i>H. ceryx</i> , <i>B.</i>               | = | <i>Leptopoma aspirans</i> , <i>B. juv.</i>    |
| <i>H. Ceylanica</i> , <i>Pfr.</i>         | = | <i>H. bistrialis</i> , <i>Beck.</i>           |
| <i>H. puteolus</i> , <i>B.</i>            | = | <i>H. clathratula</i> , <i>Pfr.</i>           |
| <i>H. Laidlayana</i> , <i>B.</i>          | = | <i>H. trifasciata</i> , <i>Ch.</i>            |
| <i>H. Bactriana</i> , <i>Hutton.</i>      | = | <i>H. strigella</i> , <i>Drap.</i>            |
| <i>H. uncineta</i> , <i>B.</i>            | = | <i>H. propinqua</i> , <i>Pfr.</i>             |
| <i>H. petrosa</i> , <i>Hutton.</i>        | = | <i>H. vitrinoides</i> , <i>Desh.</i>          |
| <i>H. Zoroaster</i> , <i>Theobald,</i>    | = | <i>H. similis</i> , <i>Fèr.</i>               |
| <i>Bulimus Andamanensis</i> , <i>Th.</i>  | = | <i>Spiraxis Haughtoni</i> , <i>B.</i>         |
| <i>B. Jerdoni</i> , <i>B.</i>             | = | <i>B. Abyssinicus</i> , <i>Rup.</i>           |
| <i>B. rivicola</i> , <i>B.</i>            | = | <i>B. arcuatus</i> , <i>Hutton.</i>           |
| <i>B. pullus</i> , <i>Gray.</i>           | = | <i>B. insularis</i> , <i>Ehr.</i>             |
| <i>B. atricallosus</i> , <i>Gould.</i>    | = | <i>B. perversus</i> , <i>L.</i>               |
| <i>B. citrinus</i> , <i>Reeve.</i>        | = | <i>B. perversus</i> , <i>L.</i>               |
| <i>B. latebricola</i> , <i>B.</i>         | = | <i>Achatina latebricola</i> , <i>B. sp.</i>   |
| <i>B. tutulus</i> , <i>B.</i>             | = | <i>Pupa tutula</i> , <i>B. sp.</i>            |
| <i>Achatina frumentum</i> , <i>Reeve.</i> | = | <i>A. gemma</i> , <i>B.</i>                   |
| <i>A. ceylanica</i> , <i>Reeve.</i>       | = | <i>A. punctogallana</i> , <i>Pfr.</i>         |
| <i>A. Nilagirica</i> , <i>B.</i>          | = | <i>A. Perrotteti</i> , <i>Pfr.</i>            |

*Table I. exhibiting the numbers of the Helicidæ in India and the proportion of vagrant species which range beyond the bounds of a single Province.*

| <i>Helicidæ.</i>   | <i>Total of species.</i> | <i>Vagrant species.</i> |
|--------------------|--------------------------|-------------------------|
| Vitrina,.....      | 12                       | None                    |
| Cryptosoma,.....   | 2                        | 1                       |
| Succinea, .....    | 12                       | None                    |
| Helix, .....       | 221                      | 14                      |
| Hypselostoma,..... | 2                        | None                    |
| Streptaxis, .....  | 9                        | None                    |
| Bulimus, .....     | 52                       | 7                       |
| Achatina, .....    | 39                       | 3                       |
| Boysia,.....       | 1                        | None                    |
| Pupa, .....        | 18                       | 1                       |
| Clausilia, .....   | 7                        | None                    |
|                    | <hr/> 375                | <hr/> 26                |

The following are the vagrant species and those only are marked thus (\*) whose distribution is peculiar, as, of course, where provinces meet, some few species trench on the adjoining province without properly belonging to it, so that the actual number of truly vagrant species is less than the number of the above table. For some of my data marked thus (†) I am indebted to my friends the Messrs. Blanford.

|                        |                        |
|------------------------|------------------------|
| Cryptosoma planospira, | Provinces I. and II.   |
| Helix Barrakporensis,† | Provinces I. and III.† |
| H. bistrialis,         | Provinces III. and V.  |

I include this species as I regard H. Ceylanica as a mere variety of it.

|               |                               |
|---------------|-------------------------------|
| H. castra,*   | Provinces I. III. IV. and V.† |
| H. capitium,* | Provinces I. and II.          |

A rare shell in the two localities known to me, the Katak jungles and hills North of Tirhoot.

|                   |                        |
|-------------------|------------------------|
| H. climacterica,† | Provinces I. and IV.†  |
| H. delibrata,*    | Provinces I. and IV.   |
| H. fallaciosa,    | Provinces III. and V.† |
| I. fastigiata,*   | Provinces I. and III.† |
| Iuttoni,*         | Provinces I. and III.† |

|                                                                                             |                                                                   |
|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| <i>H. ligulata</i> ,                                                                        | Provinces II. and III.                                            |
| <i>H. similis</i> ,*                                                                        | Provinces II. and IV. also Singapore, Mauritius, Brazil, &c., &c. |
| <i>H. Tranquebarica</i> ,                                                                   | Provinces III. and V.                                             |
| <i>H. Lychnia</i> ,*                                                                        | Province V.† also Singapore.                                      |
| <i>H. vitrinoides</i> ,*                                                                    | Provinces I. II. and III.                                         |
| <i>Bulimus Bengalensis</i> ,                                                                | Provinces I. and II.                                              |
| <i>B. Sindicus</i> ,                                                                        | Provinces I. and II.                                              |
| <i>B. gracilis</i> ,*                                                                       | Provinces I. II. III. IV. and V. also Mauritius.                  |
| <i>B. cœnopictus</i> ,*                                                                     | Provinces II. III. IV. and V. and Mozambique.                     |
| <i>B. insularis</i> * (pullus, Gray),                                                       | Provinces II. III. and IV. also Red sea, &c., &c.                 |
| <i>B. punctatus</i> ,*                                                                      | Provinces II. III. and V. also East coast of Africa, &c.          |
| <i>B. Abyssinicus</i> ,*                                                                    | Province II. and Abyssinia.                                       |
| <i>Achatina punctogallana</i> ,                                                             | Provinces III. and V.†                                            |
| <i>A. Oreas</i> ,                                                                           | Provinces II. and III.†                                           |
| <i>A. tenuispira</i> ,                                                                      | Provinces I. and IV.                                              |
| <i>Achatina fulica</i> I do not include, as it was introduced very recently from Mauritius. |                                                                   |
| <i>Pupa bicolor</i> ,*                                                                      | Provinces I. II. III. IV. and V.                                  |

*Table II. Cyclostomidæ.*

| <i>Cyclostomidæ.</i>         | <i>Total of species.</i> | <i>Vagrant species.</i> |
|------------------------------|--------------------------|-------------------------|
| <i>Pomatias</i> ,.....       | 2                        | None                    |
| <i>Hydrocena</i> , .....     | 5                        | None                    |
| <i>Otopoma</i> , .....       | 1                        | 1                       |
| <i>Hybocystis</i> , .....    | 1                        | None                    |
| <i>Clostophis</i> , .....    | 1                        | None                    |
| <i>Opisthostoma</i> , .....  | 1                        | None                    |
| <i>Cyclophorus</i> , .....   | 49                       | 2                       |
| <i>Lagocheilus</i> ,.....    | 2                        | None                    |
| <i>Leptopoma</i> , .....     | 11                       | None                    |
| <i>Megalomastoma</i> , ..... | 3                        | None                    |
| <i>Cataulus</i> , .....      | 13                       | None                    |
| <i>Pupina</i> ,.....         | 6                        | None                    |



|                    | <i>Total of species.</i> | <i>Vagrant species.</i> |
|--------------------|--------------------------|-------------------------|
| Pterocyclos, ..... | 12                       | None                    |
| Spiraculum, .....  | 2                        | None                    |
| Cyclotus, .....    | 5                        | None                    |
| Aulopoma, .....    | 4                        | None                    |
| Rhiostoma, .....   | 1                        | None                    |
| Cyathopoma, .....  | 3                        | None                    |
| Alycæus, .....     | 30                       | None                    |
| Streptaulus, ..... | 1                        | None                    |
| Rhaphaulus, .....  | 1                        | None                    |
|                    | <hr/> 154                | <hr/> 3                 |

The only three vagrant species are

|                         |                           |
|-------------------------|---------------------------|
| Cyclophorus involvulus, | Provinces II. III. and V. |
| C. pyrotrema,           | Provinces I. II. and IV.  |
| Otopoma clausum,*       | Province II. and Arabia.  |

*Summary.*

|               |                                  |       |     |
|---------------|----------------------------------|-------|-----|
| Province I.   | Total of species, .....          | 148   |     |
|               | vagrants, .....                  | 17    |     |
|               |                                  | <hr/> | 131 |
| Province II.  | Total, .....                     | 79    |     |
|               | vagrants, .....                  | 21    |     |
|               |                                  | <hr/> | 58  |
| Province III. | Total, .....                     | 59    |     |
|               | vagrants, .....                  | 8     |     |
|               |                                  | <hr/> | 51  |
| Province IV.  | Total, .....                     | 145   |     |
|               | vagrants, .....                  | 12    |     |
|               |                                  | <hr/> | 133 |
| Province V.   | Total, .....                     | 130   |     |
|               | vagrants, .....                  | 7     |     |
|               |                                  | <hr/> | 123 |
|               | Total vagrants in all provinces, |       | 29  |
|               |                                  | <hr/> |     |
|               |                                  |       | 525 |
|               |                                  | <hr/> |     |

\* This may be excluded, the shell from W. India being distinct.—Ed.

The following is a list of the land mollusca distributed through the different Provinces, though some may be erroneously placed, from the loose manner in which some species are described as simply "from India" by authors. Vagrants marked thus. (\*)

Province I.—THE HIMALAYAN.

*Family Limacidæ.*

*Limax altivagus*, *Th.* MSS.

*L. modestus*, *Th.* MSS.

*Family Helicidæ.*

*Hoplites Cassiacus*, *Th.* MSS.

*Vitrina gigas*, *B.*

*V. salius*, *B.*

*V. scutella*, *B.*

*V. cassida*, *Hutton.*

*V. monticola*, *B.*

*Cryptosoma planospira*, *B.\**

*Succinea indica*, *Pfr.*

*Helix acris*, *B.*

*H. anopleuris*, *B.*

*H. Barakporensis*, *Pfr.\**

*H. bascunda*, *B.*

*H. Blanfordi*, *Th.*

*H. bullula*, *Hutton.*

*H. calpis*, *B.*

*H. camura*, *B.*

*H. capitium*, *B.\**

*H. castor*, *Th.*

*H. castra*, *B.\**

*H. celox*, *B.*

*H. cestus*, *B.*

*H. convexa.*

*H. chloroplax*, *B.*

*H. climacterica*, *B.\**

*H. cyclotrema*, *B.*

*H. corys*, *B.*

*H. cycloplax*, *B.*

- Helix delibrata*, *B.\**  
*H. diplodon*, *B.*  
*H. fragilis*, *Hutton.*  
*H. fastigiata*, *Hutton.\**  
*H. galea*, *B.*  
*H. glauca*, *B.*  
*H. Himalayana*, *Lea.*  
*H. Hodgsoni*, *B.*  
*H. humilis*, *Hutton.*  
*H. Huttoni*, *B.\**  
*H. hyba*, *B.*  
*H. labiata*, *Pfr.*  
*H. lubrica*, *B.*  
*H. macroleuris*, *B.*  
*H. nana*, *Hutton.*  
*H. nuda*, *Pfr.*  
*H. ornatissima*, *B.*  
*H. orobia*, *B.*  
*H. oxytes*, *B.*  
*H. patane*, *B.*  
*H. (Plectopylis, B.) pinacis*, *B.*  
*H. planiuscula*, *B.*  
*H. (Plectopylis, B.) plectostoma*, *B.*  
*H. Pollux*, *Th.*  
*H. radicicola*, *B.*  
*H. rimicola*, *B.*  
*H. rorida*, *B.*  
*H. splendens*, *Hutton.*  
*H. seposita*, *B.*  
*H. sequax*, *B.*  
*H. serrula*, *B.*  
*H. submissa*, *B.*  
*H. tapeina*, *B.*  
*H. tugurium*, *B.*  
*H. vesicula*, *B.*  
*H. vitrinoides*, *Dh.\**  
var. *H. petrosa*, *Hutton.*  
*Streptaxis Theobaldi.*

*Bulimus arcuatus*, *Hutton*.

*B. Bengalensis*,\* *Lam*.

*B. Boysianus*, *B*.

*B. cœlebs*, *B*.

*B. cœnopictus*, *Hutton*.\*

*B. candelaris*, *Pfr*.

*B. ceratinus*, *B*.

*B. domina*, *B*.

*B. gracilis*, *Hutton*.\*

*B. insularis*, *Ehr*.\*

*B. Kunawarensis*, *Hutton*.

*B. rufistrigatus*, *B*.

*B. segregatus*, *B*.

*B. Sikkimensis*, *B*.

*B. Sindicus*, *B*.\*

*B. Smithii*, *B*.

*B. Sylheticus*, *B*.

*B. vibex*, *B*.

*Achatina Cassiaca*, *B*.

*A. crassula*, *B*.

*A. crassilabris*, *B*.

*A. hastula*, *B*.

*A. latebricola*, *B*.

*A. leptospira*, *B*.

*A. orobia*, *B*.

*A. pyramis*, *B*.

*A. tenuispira*, *B*.\*

*Pupa Huttoniana*, *B*.

*P. plicidens*, *B*.

*P. (Ennea) stenopylis*, *B*.

*P. (Ennea) bicolor*, *Hutton*,\*

*P. (Ennea) bora*, *B*.

*Family Auriculidæ.*

*Carychium indicum*, *B*.

*Family Diplommatinidæ.*

*Diplommatina Blanfordiana*, *B*.

*D. costulata*, *Hutton*.

*Diplommatina folliculus*, *Pfr.*

*D. diplocheilus*, *B.*

*D. Huttoni*, *Pfr.*

*D. pachycheilus*, *B.*

*D. polypleuris*, *B.*

*D. pullula*, *B.*

*Family Cyclostomidae.*

*Pomatias pleurophorus*.

*P. Himalayæ.*

*Hydrocena sarrita*, *B.*

*Cyclophorus Aurora*, *B.*

var *C. stenomphalus*, *Pfr.*

*C. exul*, *B.*

*C. Himalayanus*, *Pfr.*

*C. Pearsoni*, *B.*

var *C. Bensoni*, *Pfr.*

*C. phænotopicus*, *B.*

*C. pyrotrema*, *B.\**

*C. pinnulifer*, *B.*

*C. Siamensis*, *Sow.*

*C. tryblium*, *B.*

*C. zebrinus*, *B.*

*Lagocheilus tomotrema*, *B.*

*Leptopoma cybeus*, *B.*

*Megalomastoma funiculatum*, *B.*

*M. pauperculum*, *B.*

*Pupina imbricifera*, *B.*

*Pterocyclos Albersi*, *Pfr.*

*P. parvus*, *Pearson.*

(var *P. rupestris* ?).

*Spiraculum hispidum*, *Pearson.*

*S. sp. nov.*

*Alycæus bembex*, *B.*

*A. constrictus*, *B.*

*A. crenulatus*, *B.*

*A. gemmula*, *B.*

*A. hebes*, *B.*

- Alycæus otiphorus*, *B.*  
*A. physis*, *B.*  
*A. prosectus*, *B.*  
*A. plectocheilus*, *B.*  
*A. styliifer*, *B.*  
*A. strangulatus*, *Hutton.*  
*A. Theobaldi*, *Blanford.*  
*A. urnula*, *B.*  
*Streptaulus Blanfordi*, *B.*  
*Clausilia bacillum*, *B.*  
*C. cylindrica*, *Hutton.*  
*C. ignota*, *Th.*  
*C. ios*, *B.*  
*C. loxostoma*, *B.*

## Province II.—THE CENTRAL.

*Family Oncidiadæ.*

*Oncidium*, *sp.*

*Family Limacidæ.*

- Limax Bengalensis*, *Th. MSS.*  
*L. Memnon*, *Th. MSS.*

*Family Helicidæ.*

- Vitrina Bensoni*, *Pfr.*  
*Cryptosoma planospira*, *B.\**  
*Succinea Baconi*, *B.*  
*S. Bensoni*, *Pfr.*  
*S. crassiuscula*, *B.*  
*S. daucina*, *B.*  
*S. Girnarica*, *Th.*  
*S. subgranosa*, *Pfr.*  
*Helix asperella*, *Pfr.*  
*H. Baconi*, *B.*  
*H. Bajadera*, *Pfr.*  
*H. Bombayana*, *Grat.*  
*H. capitium*, *B.\**  
*H. decussata*, *B.*  
*H. infula*, *B.*  
*H. interrupta*, *B.*

- Helix lecythis*, *B.*  
*H. ligulata*, *Fer.\**  
*H. Nagporensis*, *Pfr.*  
*H. orcula*, *B.*  
*H. propinqua*, *Pfr.*  
*H. similis*, *Fer.\**  
*H. subjecta*, *B.*  
*H. trifasciata*, *Ch.*  
*H. vitrinoides*, *Delh.\**  
*Bulimus Abyssinicus*, *Rup.\**  
*B. Bengalensis*, *Lam.\**  
*B. Boriliæ*, *B.*  
*B. cænopictus*, *Hutton.\**  
*B. Estellus*, *Reeve.*  
*B. gracilis*, *Hutton.\**  
*B. insularis*, *Ehr.\**  
*B. militaris*, *Th. MSS.* (near *B. mavortius*, *R.*)  
*B. pertica*, *B.*  
*B. pretiosus*, *Cantor.*  
*B. punctatus*, *Anton.\**  
*B. Salsicola*, *B.*  
*B. Sindicus*, *B.\**  
*Achatina amentum*, *B.*  
*A. balanus*, *B.*  
*A. fulica*, (introduced).  
*A. gemma*, *B.*  
*A. iota*, *B.*  
*A. notigena*, *B.*  
*A. oreas*, *B.\**  
*A. prælustris*, *B.*  
*A. sarissa*, *B.*  
*A. scrutillus*, *B.*  
*Pupa bathyodon*, *B.*  
*P. bicolor*, *Hutton.\**  
*P. brevicostis*, *B.*  
*P. diploos*, *B.*  
*P. planyunculus*, *B.*  
*P. seriola*, *B.*

*Pupa tutula*, *B.*

*Boysia Bensoni*, *Pfr.*

*Family Auriculidæ.*

*Camptonyx Theobaldi*, *B.*

*Melampus fasciatus*,\* *Desh.*

*M. pulchellus*,\* *Petit.*

*Pythia plicata.*

*Cassidula mustelina*, *Desh.*

*C. auris-felis*, *Brug.*

*Auricula Chinensis*, *Pfr.*

*A. auris-midæ*, *L.\**

*A. Gangetica*, *B.*

*A. fustis*, *B.*

*Family Aciculidæ.*

*Truncatella*, *sp.*

*Family Cyclostomidæ.*

*Otopoma clausum*, *B.\*†*

*Cyclophorus indicus*, *Desh.*

*C. involvulus* *Mull.\**

*C. pyrotrema*, *B.\**

*Pterocyclos rupestris*, *B.*

*Cyclotus spurcus*, *Grat.*

*C. semistriatus*, *Sow.*

*C. subdiscoideus*, *Sow.*

Province III.—THE SOUTHERN.

*Family Helicidæ.*

*Succinea rugosa*, *Pfr.*

*Helix acuducta*, *B.*

*H. ampulla.*

*H. basileus*, *B.*

*H. Belangeri*, *Dh.*

*H. bidenticulata*, *B.*

*H. cacuminifera*, *B.*

*H. crinigera*, *B.*

*H. cysis*, *B.*

*H. fastigiata*, *Hutton.\**

• † See note ante p. 364.—Ed.



- Helix* Guerini, *Pfr.*  
*H. Indica*, *Pfr.*  
*H. Nilagirica*, *Pfr.*  
*H. Perrotteti*, *Pfr.*  
*H. (Plectopylis) retifera*, *B.*  
*H. ruginosa*, *Fer.*  
*H. sordida*, *Pfr.*  
*H. semifusca*, *Desh.*  
*H. semirugata*, *Beck.*  
*H. Shiplayi*.  
*H. solata*, *B.*  
*H. thyreus*, *B.*  
*H. Tranquebarica*, *Fubr.\**  
*H. vitellina*, *Pfr.*  
*Streptaxis Perrotteti*, *Petil.*  
*S. Watsoni*, *Blanford.*  
*Bulimus cœnopictus*, *Hutton.\**  
*B. gracilis*, *Hutton.\**  
*B. insularis*, *Ehr.\**  
*B. Nilagircus*, *Pfr.*  
*B. physalis*, *B.*  
*B. punctatus*, *Anton.\**  
*Achatina Bensoniana*, *Pfr.*  
*A. botellus*, *B.*  
*A. Punctogallana*, *Pfr. •*  
*A. facula*, *B.*  
*A. Jerdoni*, *B.*  
*A. oreas*, *B.\**  
*A. Perrotteti*, *Pfr.*  
*A. Shiplayi*.  
*Pupa (Ennea) bicolor*, *Hutton.\**  
*P. (Ennea) Pirriei*, *Pfr.*

Of the Auriculidæ of this Province I have no notes whatever.

*Family Diplommatinidæ.*

- D. Kingiana*, *Blanford.*  
*D. Nilgirica*, *Blanford.*  
*Opisthostoma Nilgircum*, *Blanford.*

*Family Cyclostomidæ.*

- Cyclophorus cœloconus, *B.*  
C. deplanatus, *Pfr.*  
C. Nilgiricus, *B.*  
C. ravidus, *B.*  
C. stenostomus, *Sow.*  
C. Shiplayi, *Pfr.*  
Pterocyclos Blandi, *B.*  
P. bilabiatus, *B.*  
P. nanus, *B.*  
Cyclotus montanus, *Pfr.*  
Cyathopoma filocinetum, *B.*  
C. malabaricum, *Blanford.*  
Alycæus expatriatus, *Blanford.*  
A. Footei, *Blanford.*

## Province IV.—THE BIRMESE.

*Family Oncidiadæ.*

- Vaginula Birmanorum, *Th. MSS.*

*Family Limacidæ.*

- Limax Peguensis, *Th. MSS.*

*Family Helicidæ.*

- Vitrina Birmanica, *Phil.*  
V. Christianæ, *Th. MSS.*  
Cryptosoma præstans, *Gould.*  
Succinea semiserica, *Gould.*  
Helix acerra, *B.*  
H. achatina, *Gray.*  
H. Akoutongensis, *Th.*  
H. anceps, *B.*  
H. artificiosa, *B.*  
Helix arx, *B.*  
H. Atkinsoni, *Th.*  
H. attegia, *B.*  
H. bifoveata, *B.*  
H. bolus, *B.*  
H. capessens, *B.*  
H. cassidula.

- H. castra, *B.\**
- H. caussia, *B.*
- H. choinix, *B.*
- H. consepta, *B.*
- H. convallata, *B.*
- H. cyclaspis, *B.*
- H. delibrata, *B.\**
- H. Gordoniæ, *B.*
- H. galata, *B.*
- H. gratulans, *Blanford.*
- H. hariola, *B.*
- H. Haughtoni, *B.*
- H. Helfer, *B.*
- H. helicophora, *Blanford.*
- H. honesta.
- H. Huttoni, *B.\**
- H. infrendens, *B.*
- H. levicula, *B.*
- H. (Plectopylis) leiophis, *B.*
- H. Merguiensis, *Phil.*
- H. molecula, *B.*
- H. octoplax, *B.*
- H. Oldhami, *B.*
- H. pausa, *B.*
- H. pauxillula, *B.*
- H. Peguensis, *B.*
- H. perpaula, *B.*
- H. petasus, *B.*
- H. petila, *B.*
- H. Phayrei, *Th.*
- H. pilidion, *B.*
- H. poongee, *Th.*
- H. pylaica, *B.*
- H. resplendens, *Phil.*
- H. refuga, *Gould.*
- H. retrorsa, *Gould.*
- H. rotatoria, *Von d Busch.\**
- H. sanis, *B.*

- H. stephus*, *B.*  
*H. Saturnia*, *B.*  
*H. scalpturita*, *B.*  
*H. similaris*, *Fer.\**  
*H. textrina*, *B.*  
*H. Theodori*, *Phil.*  
*H. Tickelli*, *Th.*  
*H. trochalia*, *B.*  
*H. uter*, *Th.*  
*Sophina calias*, *B.*  
*S. forabilis*, *B.*  
*S. schistostelis*, *B.*  
*Hypselostoma tubiferum*, *B.*  
*H. Bensoni*, *Blanford.*  
*Streptaxis Andamanica*, *B.*  
*S. Petiti*, *Gould.*  
*S. exacuta*, *Gould.*  
*S. Sankeyi*, *B.*  
*S. sp.*  
*Bulimus cœnopictus*, *Hutton.\**  
*Bulimus Haughtoni*, *B.*  
*B. gracilis*, *Hutton.\**  
*B. insularis*, *Ehr.\**  
*B. putus*, *B.*  
*B. Janus*, *Pfr.*  
*B. moniliferus*, *Gould.*  
*B. Sinensis*, *B.*  
*B. Theobaldianus*, *B.*  
*Achatina Peguensis*, *Bl.*  
*A. pertenuis*, *Bl.*  
*A. tenuispira*, *B.\**  
*A. octona*, *Gould.*  
*Pupa bicolor*, *Hutton.\**  
*Clausilia insignis*, *Gould.*  
*C. Philippiana*, *Gould.*  
*Family Auriculidæ.*  
*Pythia plicata*, *Pfr.\**  
*Auricula dactylus*, *Pfr.*  
*A. auris-Midæ*, *L.\**

*Family Diplommatinidæ.**Diplommatina sperata*, *Blanford*.*Family Cyclostomidæ.**Hydrocena illex*, *B.**H. frustrillum*.*H. pyxis*, *B.**H. Rawesiana*, *B.**Hybocystis gravis*, *B.**Clostophis Sankeyi*, *B.**Cyclophorus affinis*, *Th.**C. aurantiacus*, *Schurn*.*C. cucullatus*, *Gould*.*C. calyx*, *B.**C. cornu-venatorium*, *Sow.**C. cryptomphalus*, *B.**C. expansus*, *Pfr.**C. excellens*, *Pfr.**C. Haughtoni*, *Th.**C. balteatus*, *B.**C. foliaceus*, *Chem.**C. fulguratus*, *Pfr.**C. patens*, *Blanford*.*Cyclophorus flavilabris*, *B.**C. perdix*, *Sow.**C. speciosus*, *Phil.**C. scurra*, *B.**C. Theobaldianus*, *B.**Lagocheilus scissimargo*, *B.**Leptopoma aspirans*, *B.**L. Birmanum*, *Pfr.**Megalomastoma sectilabrum*, *Gould*.*Pupina artata*, *B.**P. arula*, *B.**P. Peguensis*, *B.**P. sp.**Pterocyclos cetra*, *B.**P. pullatus*, *B.**Rhiostoma Haughtoni*, *B.*

- Alycæus amphora*, *B.*  
*A. armillatus*, *B.*  
*A. Andamaniæ*, *B.*  
*A. graphicus*, *Blanford.*  
*A. humilis*, *Blanford.*  
*A. Ingrami*, *Blanford.*  
*A. nitidus*, *Blanford.*  
*A. pyramidalis*, *B.*  
*A. polygonoma*, *Blanford.*  
*A. Richtofeni*, *Blanford.*  
*A. scepticus*, *Blanford.*  
*A. sculptilis*, *B.*  
*A. succineus*, *Blanford.*  
*A. umbonalis*, *B.*  
*A. vestitus*, *Blanford.*  
*Rhaphaulus chrysalis*, *Pfr.*  
*Helicina Andamanica*, *B.*  
*H. Merguiensis*, *Pfr.*

## Province V.—THE CINGALESE.

*Family Oncidiadæ.*

- Vaginula maculata*, *Templeton.*

*Family Helicidæ.*

- Vitrina Edgariana*, *B.*  
*V. irradians*, *Pfr.*  
*V. membranacea*, *B.*  
*Succinea Ceylanica*, *Pfr.*  
*Helix bistrialis*, *Beck.\**  
*H. Ceylanica*, *Pfr.*  
*H. biciliata*, *Pfr.*  
*H. carneola*, *Pfr.*  
*H. Cingalensis*, *B.*  
*H. Chenui*, *Pfr.*  
*H. Charpentieri*, *Pfr.*  
*H. coriaria*, *Pfr.*  
*H. ceraria*, *B.*  
*H. concavospira*, *Pfr.*  
*Helix clathratula*, *Pfr.*

- Helix convexiuscula*, *Pfr.*  
*H. corylus*, *Reeve.*  
*H. cyix*, *B.*  
*H. Emiliana*, *Pfr.*  
*H. (Corilla). erronea*, *Pfr.*  
*H. fallaciosa*, *Fer.\**  
*H. galerus*, *B.*  
*H. Ganoma*, *Pfr.*  
*H. Gardneri*, *Pfr.*  
*H. hæmastoma*, *L.*  
*H. hyphasina*, *Pfr.*  
*H. Isabellina*, *Pfr.*  
*H. Juliana*, *Gray.*  
*H. Layardi*, *B.*  
*H. lychnia*, *B.\**  
*H. miccyla*, *B.*  
*H. melanotragus*, *Born.*  
*H. superba*, *Pfr.*  
*H. mononema*, *B.*  
*H. marcida*, *B.*  
*H. nepos*, *Pfr.*  
*H. novella*, *Pfr.*  
*H. partita*, *Pfr.*  
*H. perfucata*, *Pfr.*  
*H. Phoenix*, *Pfr.*  
*H. politissima.*  
*H. regulata*, *B.*  
*H. (Corilla) Rivolii*, *Desh.*  
*H. Rosomonda*, *B.*  
*H. Skinneri*, *Reeve.*  
*H. semidecussata*, *Pfr.*  
*H. serrucula*, *Pfr.*  
*H. subopaca*, *Pfr.*  
*H. subconoidea*, *Pfr.*  
*H. Taprobanensis*, *Dohrn.*  
*H. Thwaitesi*, *Pfr.*  
*H. trifilosa*, *Pfr.*  
*H. umbrina*, *Reeve.*

- Helix vittata*, *Mull.*  
*H. vilipensa*, *B.*  
*H. Waltoni*, *Reeve.*  
*H. Woodiana*, *Pfr.*  
*Streptaxis Cingalensis*, *B.*  
*S. Layardiana*, *B.*  
*Bulimus albizonatus*, *Reeve.*  
*B. adumbratus*, *Pfr.*  
*B. Ceylanicus*, *Pfr.*  
*B. cœnopictus*, *Hutton.\**  
*B. fuscoventris*, *B.*  
*B. gracilis*, *Hutton.\**  
*B. intermedius*, *Pfr.*  
*B. Mavortius*, *Reeve.*  
*B. panos*, *B.*  
*B. proletarius.*  
*B. punctatus Anton.\**  
*B. rufopictus*, *B.*  
*B. trifasciatus*, *Brug.*  
*Achatina capillacea*, *Pfr.*  
*A. inornata*, *Pfr.*  
*A. nitens*, *Gray.*  
*A. punctogallana*, *Pfr.\**  
*A. pachycheila*, *B.*  
*A. parabilis*, *B.*  
*A. panætha*, *B.*  
*A. serena*, *B.*  
*A. veruina*, *B.*  
*Pupa bicolor*, *Hutton.\**  
*P. ceylanica*, *Pfr.*  
*P. mimula*, *B.*  
*P. muscerda*, *B.*

*Family Auriculidæ.*

- Melampus Ceylonicus*, *Petit.*  
*M. Layardi*, *H. et A. Adams.*  
*Pythia Ceylanica*, *Pfr.*  
*P. ovata*, *Pfr.*  
*Truncatella Ceylanica.*



*Family Cyclostomidæ.**Cyclophorus alabastrinus*, *Pfr.**C. annulatus*, *Trosch.**C. Bairdi*, *Pfr.**C. Ceylanicus*, *Sow.**C. cratera*, *B.**C. cytopoma*, *B.**C. cadiscus*, *B.**C. involvulus*, *Mull.\***C. loxostoma*, *Pfr.**C. punctatus*, *Grat.**C. parapsis*, *B.**C. parva*, *B.**C. Thwaitesi*, *Pfr.**Leptopoma apicatum*, *B.**L. conulus*, *Pfr.**L. elatum*, *Pfr.**L. flammeum*, *Pfr.**L. halophilum*, *B.**L. orophilum*, *P.**L. pæcilum*, *Pfr.**L. semiclausum*, *Pfr.**Cataulus Austenianus*, *Pfr.**C. aureus*, *Pfr.**C. Cumingi*, *Pfr.**C. decorus*, *B.**C. duplicatus*, *Pfr.**C. eurytrema*, *Pfr.**C. Layardi*, *Gray.**C. marginatus*, *Pfr.**C. pyramidatus*, *Pfr.**C. Templemanni*, *Pfr.**C. Thwaitesi*, *Pfr.**C. Blanfordi*, *Dohrn.**Pterocyclos bifrons*, *Pfr.**P. Cingalensis*, *B.**P. Cumingi*, *Pfr.**P. Troscheli*, *B.*

- Aulopoma grande*, *Pfr.*  
*A. helicinum*, *Chem.*  
*A. Itieri*, *Guer.*  
*A. sphæroideum*, *Dohrn.*

## Province VI.—THE GERMANIC.

But little is known of the portion of this vast province which comes within the scope of my remarks, and I merely allude to it, as many of its well known species wander down to the confines of India and must clearly be arranged by themselves.

*Family Limacidae.*

- Parmacella etnilla*, *Hutton.*  
*Vitrina baccata*, *Hutton.*  
*Succinea Pfeifferi*, *Ross.*  
*S. putris*, *L.*  
*Helix Candaharica*, *Pfr.*  
*H. costata*, *Mull.*  
*H. fulva*, *Drap.*  
*H. nitida*, *Beck.*  
*H. pulchella*, *Mull.*  
*Bulimus eremita*, *B.*  
*B. Griffithii*, *B.*  
*B. lubricus.*  
*Pupa muscorum*, *L.*  
*P. lapidaria*, *Hutton.*

TABLE III.—*Exhibiting the numerical distribution of species in the Provinces.*

Some discrepancy may be remarked between this Table and Tables I. and II., as some species are included in them, whose exact habitat is not certainly known to me.

| <i>Genera.</i>                        | <i>Provinces.</i> |     |      |     |    |     |
|---------------------------------------|-------------------|-----|------|-----|----|-----|
|                                       | I.                | II. | III. | IV. | V. | VI. |
| <i>Oncidium</i> , <i>Buch.</i> .....  | 0                 | 1   | 0    | 0   | 0  | 0   |
| <i>Vaginula</i> , <i>Fer.</i> .....   | 0                 | 0   | 0    | 1   | 1  | 0   |
| <i>Limax</i> , <i>L.</i> .....        | 2                 | 2   | 0    | 1   | 0  | 0   |
| <i>Parmacella</i> , <i>Cuv.</i> ..... | 0                 | 0   | 0    | 0   | 0  | 1   |
| <i>Hoplites</i> , <i>Th.</i> .....    | 1                 | 0   | 0    | 0   | 0  | 0   |
| <i>Vitrina</i> , <i>Drap.</i> .....   | 5                 | 1   | 0    | 2   | 3  | 1   |
| <i>Cryptosoma</i> , <i>Th.</i> .....  | 1                 | 1   | 0    | 1   | 0  | 0   |
| <i>Succinea</i> , <i>Drap.</i> .....  | 1                 | 6   | 1    | 1   | 1  | 2   |

| Genera.                                     | Provinces. |     |           |     |     |     |
|---------------------------------------------|------------|-----|-----------|-----|-----|-----|
|                                             | I.         | II. | III.      | IV. | V.  | VI. |
| <i>Helix, L.</i> .....                      | 53         | 17  | 22        | 55  | 51  | 5   |
| <i>Plectopylis, B. (excluding Corilla),</i> | 2          | 0   | 1         | 4   | 0   | 0   |
| <i>Sophina, B.</i> .....                    | 0          | 0   | 0         | 3   | 0   | 0   |
| <i>Hypselostoma, B.</i> .....               | 0          | 0   | 0         | 2   | 0   | 0   |
| <i>Streptaxis, Gray.</i> .....              | 1          | 0   | 2         | 5   | 2   | 0   |
| <i>Bulimus, Scop.</i> .....                 | 18         | 13  | 6         | 9   | 13  | 3   |
| <i>Achatina, Lane.</i> .....                | 9          | 10  | 8         | 4   | 9   | 0   |
| <i>Pupa, Drap.</i> .....                    | 5          | 7   | 2         | 1   | 4   | 2   |
| <i>Boysia, Pfr.</i> .....                   | 0          | 1   | 0         | 0   | 0   | 0   |
| <i>Clausilia, Drap.</i> .....               | 5          | 0   | 0         | 2   | 0   | 0   |
| <i>Camptonyx, B.</i> .....                  | 0          | 1   | 0         | 0   | 0   | 0   |
| <i>Melampus, Mont.</i> .....                | 0          | 2   |           | 0   | 2   | 0   |
| <i>Pythia, Bolten.</i> .....                | 0          | 1   | No notes. | 1   | 2   | 0   |
| <i>Cassidula, Fer.</i> .....                | 0          | 2   |           | 0   | 0   | 0   |
| <i>Auricula, Lam.</i> .....                 | 0          | 4   |           | 2   | 0   | 0   |
| <i>Carychium, O. F. Muller.</i> .....       | 1          | 1   |           | 0   | 0   | 0   |
| <i>Truncatella, Risso.</i> .....            | 0          | 1   |           | 0   | 1   | 0   |
|                                             | 104        | 71  | 42        | 94  | 89  | 14  |
| <i>Diplommata, Benson.</i> .....            | 8          | 0   | 2         | 1   | 0   | 0   |
| <i>Pomatias, Studer.</i> .....              | 2          | 0   | 0         | 0   | 0   | 0   |
| <i>Hydrocena, Parreyss.</i> .....           | 1          | 0   | 0         | 4   | 0   | 0   |
| <i>Otopoma, Gray.</i> .....                 | 0          | 1   | 0         | 0   | 0   | 0   |
| <i>Hybocystis, Benson.</i> .....            | 0          | 0   | 0         | 1   | 0   | 0   |
| <i>Clostophis, Benson.</i> .....            | 0          | 0   | 0         | 1   | 0   | 0   |
| <i>Opisthostoma, Blanford.</i> .....        | 0          | 0   | 1         | 0   | 0   | 0   |
| <i>Cyclophorus, Montfort.</i> .....         | 10         | 3   | 6         | 15  | 13  | 0   |
| <i>Lagocheilus, Theobald MSS.</i> ..        | 1          | 0   | 0         | 1   | 0   | 0   |
| <i>Leptopoma, Pfeiffer.</i> .....           | 1          | 0   | 0         | 2   | 8   | 0   |
| <i>Megalomastoma, Guilding.</i> .....       | 2          | 0   | 0         | 1   | 0   | 0   |
| <i>Cataulus, Pfeiffer.</i> .....            | 0          | 0   | 0         | 0   | 12  | 0   |
| <i>Pupina, Vignard.</i> .....               | 1          | 0   | 0         | 4   | 0   | 0   |
| <i>Pterocyclos, Benson.</i> .....           | 2          | 1   | 3         | 2   | 4   | 0   |
| <i>Spiraculum, Pearson.</i> .....           | 2          | 0   | 0         | 0   | 0   | 0   |
| <i>Cyclotus, Guilding.</i> .....            | 0          | 3   | 1         | 0   | 0   | 0   |
| <i>Aulopoma, Troschel.</i> .....            | 0          | 0   | 0         | 0   | 4   | 0   |
| <i>Rhiostoma, Benson.</i> .....             | 0          | 0   | 0         | 1   | 0   | 0   |
| <i>Cyathopoma, Blanford.</i> .....          | 0          | 0   | 2         | 0   | 0   | 0   |
| <i>Alycæus, Gray.</i> .....                 | 13         | 0   | 2         | 15  | 0   | 0   |
| <i>Streptaulus, Benson.</i> .....           | 1          | 0   | 0         | 0   | 0   | 0   |
| <i>Rhaphaulus, Pfeiffer.</i> .....          | 0          | 0   | 0         | 1   | 0   | 0   |
| <i>Helicina, Lamarck.</i> .....             | 0          | 0   | 0         | 2   | 0   | 0   |
|                                             | 44         | 8   | 17        | 51  | 41  | 0   |
| Total number of species per Province,       | 148        | 79  | 59        | 145 | 130 | 14  |

*Account of a visit to the hot springs of Pai in the Tavoy district.*  
*By Capt. J. F. STEVENSON, Deputy Commissioner.*

(Communicated by T. OLDHAM, Esq., F. R. S.)

I have the pleasure of sending with this letter, a case containing four quart bottles of water and confervæ, one soda water bottle of the same, and two packets of stones, which I collected a few days ago at the hot springs near *Pai* in this district.

The four quart bottles and the packet of stones not labelled, are all from the remarkable springs which I believe to be partially, (but I should say inaccurately,) described in Mason's *Tenasserim*, page 18. He says that "According to Phillips they are hotter than any on record out of volcanic regions, 'with the questionable exception of three springs in China, which probably exceeded the temperature of the air from 70 to 120 degrees.' The principal spring at *Pai*,—for there are several, is in a little sandy\* basin in the midst of granite rocks, on the margin† of a cold water stream, where it bubbles up from three or four vents, and on immersing the thermometer into one, the mercury rises to 198°, within fourteen degrees of boiling water. Its location is rather peculiar, not being in a valley like the others I have seen, but on the side of a hill more than a thousand‡ feet above the level of the sea, and surrounded by large masses of coarse-grained granite rocks, which seem to have been detached from the summit above."

These springs are in a small mountain stream called by the people, the hot-water stream, (*Ye boo Hkyoung*), and about 2 miles from the *Pai* river.

The soda-water bottle and the second packet of stones are labelled. They are from a small spring on the bank of, and quite close to the *Pai* river.

The *Pai* river is about 65 miles south from Tavoy town, near the Mergui boundary. It rises in the range of hills which intersects this district between the Tenasserim and the Tavoy river valleys,

\* No sand.

† See page 385.

‡ 300 feet.

and after a generally direct East and West course falls into the sea about 6 miles below the village of *Kyaukhtsay*.

*Pai Dap* the nearest village to the springs, is about 5 miles East, and inland from *Kyaukhtsay*; and thence to the great hot springs on the "hot-water stream," the distance is about  $10\frac{1}{4}$  miles: the direction of the road is generally East for about 8 miles, and then Southerly, up the course of the hot stream for about 2 miles.

I visited these streams about a week ago in company with the Rev. Charles Parish, Chaplain of Moulmein, and Lieutenant Harrison, Deputy Commissioner of Mergui. The following is a short and I fear unscientific account of the visit.

On the 21st January we left *Kyaukhtsay* about 6 A. M. and reached *Pai Dap* at 7.30. This is a neat village of ten houses, pleasantly situated on the North bank of the *Pai* river, about N. E. from *Kyaukhtsay*. It has a pretty good *Zayat* (rest house). The path hence runs about East; and generally through thick jungle. A good deal of cutting down was necessary, to open it up in some places: ground generally smooth and level. We halted after a brisk walk of 2 hours and 5 minutes, at a shady spot on the *Pai* stream, about  $7\frac{1}{4}$  miles from *Pai Dap*, and started again between 2 and 3 P. M. We were told that we were now about half way between *Pai Dap* and the stream: and before leaving *Pai Dap* we had been led to expect that we had a 20-mile march before us.

The distance from this halting-place proved to be only about 3 miles. The path much the same as in the first part of the journey, with one or two bad bits: it was rather more up and down, and crossed the *Pai* river in one or two deep places. The latter part, perhaps half of it, was up the course of the hot-water stream:—and we came to hot water, (that is the water of the stream was hot),  $\frac{1}{4}$  of a mile before we reached the springs.

A heavy column of steam, which I at first mistook for the smoke of camp fires, or burning jungle, shewed us the whereabouts of the hot springs, some 100 yards off. The last part of the path was a steep ascent, but we estimated that we had not ascended altogether more than 300 feet from *Pai Dap*. The total distance thence was about  $10\frac{1}{4}$  miles. We found the springs in a narrow granite rock channel, through which a shallow stream falls in little cascades, divided by small pools. The most striking feature of the scene was the jet of

steam which seemed to give off the greater portion of the clouds of steam overhead. It rushes out of a hole nearly midway down a cascade some 6 feet high, with a noise precisely like that of a steam-jet, and with such force, that it drives the water of the cascade horizontally out 4 or 5 feet. The water which issues from this hole with the steam, or at least comes into contact with the steam, was hot enough to boil an egg well enough to eat, in 3 minutes. There are several holes in the pools above this cascade, but all within 15 yards of it, from which hot water bubbles up. The stream above the pools containing these bubbling holes, is cold, and the water, close to and around the upper or higher holes of the stream, is also cold. The holes from which the hot water spouts up are all small: the water from them is so hot, that we boiled eggs in all of them, fit to eat in 3 minutes. No steam arose from these holes. The stream itself there is a cold stream, until it reaches the hot water springs or holes: from these, jets of hot water spout up into it, and the water below them becomes warm at once: below the cascade it is hot and continues so, as we proved, for a quarter of a mile; perhaps further on. You will observe that Mason records that the temperature of these springs is 198°. We all thought it that, if not higher. By an unfortunate mischance we had not a thermometer with us. The water had no unpleasant taste or smell.

There are other large and small jets of steam below the cascade; one about 30 yards lower down is a remarkable one. It escapes in a broad column from under a rock with the loud sound of an engine blowing off. All the rocks (granite) about the hot water are hot: and the ground on which we slept, about 30 yards from the stream, and several feet higher than it, became very hot under our beds at night. We removed some stones and found the ground hot beneath them. We dug a hole near our beds, and steam began to rise from it at 8 or 9 inches from the surface of the ground. Two of our party heard a rumbling sound several times during the night, which may have been thunder, but which appeared to us to be subterranean.

We walked only about two miles of the way back, and descended the rest of the distance in small bamboo rafts, (12 bamboos about 20 or 22 feet long), to *Pai Dap*: water distance, about 12 miles: time occupied, nearly 4 hours. About half way down we collected the water in the Soda water bottle, and the labelled stones, on the left

bank of the *Pai* river ; the water here was very shallow, without steam or bubbles. It contained much *confervæ* ; and you will see that the stones from it are coated with a saline crust.

*Memorandum.*—By A. TWEEN, Esq.

I have examined the water from the spring near *Pai*. The substances present are Iron, Alumina, Lime, Potash, Soda, Silica, Hydrochloric Acid, Sulphuric Acid, Hydro-sulphuric Acid and Organic matter which is nitrogenous.

Of the 4 bottles sent, 2 were empty, one but half full, through being imperfectly corked, and the fourth held, besides water, a considerable quantity of stones and water plants.

The siliceous deposit contains in addition to Silica, Iron, Alumina, Lime, Potash, Soda, a trace of Magnesia, Carbonic Acid, Sulphuric Acid, Hydrochloric Acid and Organic Matter. There is about 12 to 14 per cent. of soluble matter, of which the greater part is Carbonate of lime.

The Soda water bottle which held water from the second spring had nothing in it but stones and *confervæ*. This had a fetid smell, was alkaline to test paper, and evolved Ammonia on being treated with Hydrate of lime.

Some of the stones which accompanied the Soda water bottle are coated with deposit from the spring, but not in any quantity : this is calcareous.

*A visit to Xiengmai, the principal City of the Laos or Shan States.—*

*By Sir ROBERT H. SCHOMBURGK, Kt. F. R. S., Her Majesty's Consul at Siam.*

It will be requisite before I read my remarks on Xiengmai to preface them by some observations. The journey was undertaken to acquire some knowledge of the interior of Siam as far as the city of Xiengmai,\* called variously Changmai, Zimay, Zumay, and in the inflated language of the Asiatics, by the Burmese, “the City of the Golden Palace,” although if such a splendid structure once existed, it must have been swept away, for nothing palatial did I observe in the structure of any of the habitations in that city.

From Xiengmai, I planned to turn eastward to Maulmain and by the Gulf of Bengal to Tavoy, and to return from thence by crossing the great mountain chain to Bangkok.

His Majesty the first King had provided me with a royal letter, enjoining the authorities of the places through which we had to pass, to give us every assistance, and to provide us with provisions, where such were to be had, on the public account. Two comfortable boats, the oarsmen dressed in the Royal livery, were placed at my disposal; Mr. Clarke, one of the student interpreters of the Consulate, and two nephews of the King, sons of Prince Krom Lluang Wongsā, who were then residing with me in the Consulate, accompanied me.

We left Bangkok on the 12th of December, 1859, rapidly progressing, but having passed the tidal waters, we found soon that we had started a fortnight too late for our heavy boats. The river was rapidly falling, and we had often to dig channels through the sandbanks to get along.

On the 28th day after our departure from Bangkok, we reached Raheng the most southern of the Lao cities. Here we resolved at once to send the boats back to Bangkok, and to continue our journey over land on elephants.

This mode of travelling was certainly any thing but comfortable; and although we had two ponies to vary it occasionally, the fourteen days which we required to reach Lamboon were fatiguing and tedious

\* The late Bishop Palegoix explained to me that it was called Xiengmai, the new City, in contradistinction of the one which had been destroyed by the Baroma-zaxa-thirat in 1430.



enough. We arrived at Lamboon on the 11th of February and left it on the 14th, much to the regret of the Governor, who wished us to stay some time longer. I shall now take up my more detailed description of our further progress to Xiengmai, which is only one day's journey from Lamboon.

As already mentioned, we left Lamboon at half-past 9 o'clock A. M., of the 14th February, passed round the north gate and turned into the Xiengmai road. The suburb of the city extended for more than half a mile on our right. We traversed the canal which brings the water from the Méping to Lamboon, serving in its course to irrigate the whole adjacent country by numerous side canals. At the point where we forded it, branches as large as the main canal itself flow to the right and to the left. Indeed it was a perfect network of canalization, so that every cultivator might get his supply of water.

Villages and habitations were on both sides of our road. It was a succession of them ; generally surrounded with trees, they formed bands extending N. and S., between which, for miles in breadth, the ground was cultivated with rice.

Our road led us through the village of Luk—the *Wat* at its entrance is very neat ; the roof is supported within by eight columns of scarlet colour, richly ornamented with gilt tracery. The other buildings which belong to the *Wat* were merely built of unbaked bricks.

Having passed the groves of trees that surround the village, we saw before us on both sides of the canal, gardens planted with vegetables, tobacco, safflower, and here and there some indigo. A number of women and girls, some of the latter no more than five or six years of age, were employed to water the plants, while the men were sitting under the shade of a shelter, the frame prepared of bamboo and covered with large leaves, so constructed that it might be turned east or west according to the position of the sun, their only employment being to smoke and to see what the women and children were doing. To facilitate the method of irrigation a kind of huge shovel or ladle of basket-work, fixed to a pole, is used, which works upon a crinkle or fork, and dips in the canal ; the water is taken up and transferred to a tank, from whence it flows by trenches to the different parts of the field.

From Bang Pokok, a hamlet, the elephants had to wade for a considerable distance through water. The canal had been forced by a dam to throw its waters over the adjacent fields, to render them pro-

per for transplanting the yet tender rice-plants. What a multitude there were employed!—men, women and children, waded more than ankle deep,—every one so busy—a kind of basket slung over their shoulders which contained the young plants—a stick in their right hand, to thrust a hole in the soil below the water, the left ready to place there one of the seedlings, and to insure for it a hold by pressing the mud to its roots: the number of plants thus fixed into the soil in a given time, is very large.

Our harvest gatherings, the fields speckled with people, can only convey an idea of the prospect before me—and nevertheless how different the persons thus occupied, how different the scenery from that in my own home, which brought the comparison to my recollection!

Having passed the large village Tavong-tawng, we had to cross the river Ping to its right bank, (which, from its junction with the Wang forms the Me'nam). While fording it, I admired the pretty view which the tower or Pagoda of Wat Hong offered to us, rising to a height of above 150 feet, the river scenery lovely, with high mountains in the back ground, and the banks lined with numerous people, led by curiosity to see us pass, the fair sex dressed in Lao petticoats, which in consequence of their bright colours, added to the liveliness of the picture.

Having crossed the river, we saw Xiengmai before us, distant about a mile, the intervening space consisting of rice-fields, only interrupted by Wat Papá-ow surrounded by a wall and shaded by large trees. On approaching the city, I saw a number of peculiarly shaped towers, evidently built of bricks, and so odd in appearance that it seemed they had been standing there for centuries, without any person caring whether they might fall down, or be taken possession of by a tropical vegetation, which had already covered them with twiners and creepers. These towerlets are Phratshedees, the tops of Buddhist architecture.

Our residence had been erected outside the city walls, between the bridge which leads over the Méping and the east gate of Xiengmai. The principal house erected for our reception, was on a larger scale, and neater in execution, than any we had yet inhabited. Opposite stood the public Sala, a large wooden building; near it a little towerlet likewise of wood, as a look-out, and the usual stand for mounting and dismounting the elephants; the whole space, including the huts for our own servants, was surrounded by a fence constructed of bamboo.

With the exception of the Sala and the look-out, the other structures had been all expressly prepared for us—moreover sheds had been built outside the fence for our escort.

We found a large number of people assembled between the bridge and the city gate to witness our arrival ; some were standing ; others, sitting in groups or pressing near us. They were a medley crowd. The true Lao in turbaned kerchief, with his tartan-like Khatung, worn as the Scotch wear their plaid ; the Thai or Siamese merely girdled round the loins ; the fat smiling Chinese in his blue vestments ; and to make the medley still more conspicuous, there were likewise inhabitants from Muang Teli in the Chinese Province of Yunnan, a caravan of which had arrived a day or two previous : all these people added to the peculiarity of the scene before us. Fatigued, I slept soundly, but what a stir there was on awakening, from the early morning hours, in front of our residence. The bridge is the great public thorough-fare for the population residing on the left bank of the Méping, not only in the suburb, but likewise for those in the adjacent country. A number of these persons come daily to town, to sell or purchase : the women entered in parties, consisting of twenty or thirty ; seldom accompanied by men, passing in single file towards the city gate. The Lao females, have long glossy hair of an intense black, which, with tidy persons, is neatly plaited and gathered in a knot behind, the hair of the forehead being drawn up backwards in the manner of the Chinese women. They wear the Lao petticoat, more or less ornamented with gold thread, and embroidered with silk of bright colours. The married women are moreover dressed in a jacket or spenser, closely fitting as far as the waist, and from thence expanding more amply until it reaches nearly to the knee. This vestment resembles the polka spenser formerly so fashionable in England and on the Continent. Those who can afford it, have rich necklaces, and rings in their ears and on their fingers ; their arms and ankles surrounded by circlets of gold or silver ; a silk shawl or scarf of red or rose colour is thrown loosely over their shoulders. The latter refers to the married women—young ladies, unmarried, do not dress above their waist.

Black and shining as their hair is, the racemes of the white flowered *Moringa* or the fragrant *Vateria*, or if such be not in blossom, those of any other tree or plant similar in colour, set it off much more by

the great contrast, when these flowers are placed in their raven tresses. The mouth of the young girls is formed exquisitely. But few of the Lao women indulge in betel chewing, hence they do not render that organ, so fairly formed by nature, hideous by the prevailing custom of the Thai; and their teeth remain white as nature made them.

Though much fairer in colour, in stature they, like the Indians of Guiana, very seldom reach a height above 4 feet 10 inches.

The men wear generally the Khatung or Lao plaid, but a number are dressed in blue or white tunics, fitting closely and reaching like the sponser of the women to the knee. The hair of the head is allowed to grow; only when it becomes too long, it is cut; some have whiskers, a custom not adopted by the Thai, where nature has yielded him hairs on his cheeks. I observed but few instances of the tuft of hair on the crown, as worn by the Siamese proper.

They dress their children very neatly; on the head, they place a cap consisting of seven pieces, in the shape of a cardinal's cap, made of scarlet cloth with a band of black velvet below, embroidered with gold thread. Boys of six years and upwards, are dressed in the close fitting tunic, and, according to the wealth and standing of the parents they are made of velvet, or white cotton cloth.

The Laos consist, it may be said, of two clans, namely such as who, if men, paint their bodies from the waist to the knee, and designate themselves as the Thong dam or "black bellies," and the others who do not paint, as Thong Khao or "white bellies." I saw more of the former than of the latter in and about Xiengmai. The tattooing represents figures of dragons, tigers, labyrinths, &c. The operation of producing these figures is upon the same principle as our sailors employ, to have anchors, crosses and other figures printed upon their arms. Several of our own men had the operation performed, without exhibiting their suffering great pain under the operation.

There is little design in the tattooing; sometimes patches of colour produced by Indigo, exhibit no figure whatever.

The Guiana Indians show much more design in painting their bodies, and a belle of the Carib or Macusi tribe, will not consider it too tedious, when preparing for attendance at some great display, to submit to the painter's brush for 8 or 10 hours at a sitting.

The generality of the men and women among the Lao, walk like the Indians of Guiana, one foot set before the other, without turning the

little toe outside. They have another fashion similar to the Guianese, namely the ear-lap is bored and a piece of bamboo is inserted, its two ends ornamented by a piece of looking-glass ; or in lieu of the bamboo merely a scroll of bark is placed in the ear-lap. This fashion belongs more particularly to the inhabitants of the eastern province, of which Muang Nan is the capital. A number of these people were in Xieng-mai on trading speculations, having brought cotton for sale to where but little is cultivated. They were staying on the other side of the river during their sojourn, and daily passed our place in going to the city: they could not fail attracting attention by their darker complexion and slighter stature than the Laos. Their dress is also very different: they have trowsers like the Chinese and a small jacket of cotton cloth, that once might have been white but now looks doubtful as regards colour. The hair is worn tied up in a knot at the back part of the head, like that of the Lao females, with the difference that they do not keep it in such good order. Their legs are painted like those of the Lao Thong-dam, and the head is covered by a plaited hat with a most expansive rim, to protect the bronze features of its wearer against the effects of the sun.

The Deputy Viceroy Chao Operat called on us shortly after noon. He was a man of an advanced age, dressed meanly without shirt or shoes, very different in appearance from any of the officials of a similar rank which I had previously met. He came on foot, observing that some disease from which he suffered, prevented him from riding on horseback. We of course used our ponies to carry us to his residence after our interview had ended, and he had proposed that we should accompany him there.

The King's letter was conveyed in the usual manner to the Deputy Viceroy's residence. The latter was anything but palatial for so high a personage: the greatest ornaments in the hall were a large number of embroidered pillows—similar to the one which I had received in Bangkok from his superior, the actual Viceroy Chao-kavi Rorot Suriwong, who was then there on a visit.

We had some difficulty to get a person to read the letter written to him by the King's order, which was in the Siamese language and characters: the Lao differs in both points, and I am told that the difference is more than dialectical. The Officer who came with us from Raheng, read it ultimately to the prostrate multitude, the Chao Operat

keeping his high backed chair, and we ours, for I made it always a point to have carried to such audiences, two cane chairs for myself and Mr. Clarke, which I had brought with me from Bangkok, (and I may as well observe *en parenthese*, I brought them back thither on my return).

As soon as the ceremony was performed, we returned to our residence ; I saw already that Chao Operat was not very favourably inclined to us.

On our return from the Deputy Viceroy, we took a ride through the town. The bazar is held in the principal street, extending east and west : the goods for sale are exposed in open stalls along the lines of the street. They consist of English manufactured goods, such as cotton handkerchiefs, print-, cups and saucers, plates, needles and thread ; raw silk from China, lacquered boxes from Ava and a number of knick knacks from other countries. For the sake of opposition, I believe, speculating geniuses exhibit for sale in the next stall, pork, vegetables, and the indispensable betel-nut with all its accessories. There were, likewise short clay-pipes and tobacco finely cut, similar to the Turkish, for supplying them with the necessary ingredient. The stalls in the bazar are tenanted by women, who, when their attention is not claimed by purchasers, occupy themselves with making those pretty embellishments or embroideries worked with gold thread and all kinds of coloured silks, which adorn the Lao ladies' petticoats. Others were occupied in embroidering upon black velvet, ornamental designs according to their conception, for the covering of head cushions, and here and there the mother would have her darling, of course the youngest, to nurse, notwithstanding that her fingers were busily employed in embroidering. The silk for the manufacture of petticoats, &c., is imported from the Chinese territories.

We extended our ride round the town "proper" not including the suburb. It is surrounded by a double wall—each wall having a ditch in front. The entrance to the town is by double gates with bastions to protect them. The suburbs are stockaded, but the gates of that portion of the town, are also fortified. I regret that some differences which arose between myself and Chao Operat, regarding the jurisdiction over British subjects residing in Xiengmai, rendered every act I did, suspicious in the eyes of that individual, and I could not ascertain with precision the extent of the city. I believe, however, that it is no less

than two miles and a half in length, including the suburb to the south-west. The number of inhabitants amounts probably to 50,000, of whom 5,000 are able to bear arms: such a contingent force was furnished to Prince Krom Lluang Wongsā in his late attack upon Chiangtung.

The streets of the city have originally been laid out at right angles. Time it seems has worked changes with regard to their regularity; nevertheless I have not seen any other Siamese city, laid out apparently so regularly at its foundation, as Xiengmai appears to have been.

The habitations are seldom, if ever, placed so as to front the street; they stand some distance back. In their structure they do not differ materially from such as I saw in the other Lao towns: however those of the high nobility are not surrounded with walls as in Lakong, to prevent any vulgar prying on what is going on within.

There are numerous Wats in the city, but none can vie in extent or appearance with Wat Luang in Lamboon. At some of the Wats I noted the peculiar towerlets or Phratshedees. The number of these isolated towerlets is large; they not only surround the city, but extend for a mile or more beyond it, principally to the west. I have already remarked that they are the topes of Buddhist architecture, erected to commemorate some of the actions of the last Buddha, when wandering upon our globe, promulgating his doctrines. I doubt that they contain relics. "We pray to Gaudama on passing a Phratshedee," an intelligent person told me, "they are built in memory of him and his divine acts, and some of his doctrines are written there on tablets."

These remarkable towers are only cased with stone-work and filled up with the soil from near to the place where they stand. I judge so from two or three instances where the stone casing had given way so as to expose the interior mass. Half way up the height of the tower, seen from outside, is a belt or string course—sometimes the space is divided and there are two; and at about 30 to 40 feet above the base, rises the dome, crowned by a *tee* with narrow blind windows, terminating in a spire consisting of from 5 to 7 umbrellas or disks, each decreasing in size until the spire ends in a sharp point, ornamented with small bells, that tinkle when they are moved by the wind. Only in a few instances the domes have retained their termination perfect: owing to neglect of the requisite repairs, they are mostly broken off.

The nature and object of topes at Xiengmai, the only place where I have seen them in Siam, not connected with Wats or forming parts

of the temple for worship, is no doubt the same as in Central India, in the Punjab, Afghanistan and in Ceylon; either to contain relics of Buddha and his disciples, or to commemorate some of his acts during his pilgrimage upon earth.

There are few persons at Bangkok who have not heard of the celebrated image of Buddha, which, by those who follow his religion, is considered to be the acme of what can be adored in a visible shape. It is now in the Royal Wat.

This image was discovered in 1436 in the city of Chiangrai or Xiengrai about forty miles N. N. E. from Xiengmai. A small pagoda which contained this precious image, over which a second building had been erected, was struck by lightning, and thus it was exposed to view.

This precious image was removed to Xiengmai, (then as now the principal town of the Lao country,) which was being rebuilt after its destruction in 1430. Several other localities, amongst them Lamboon, were afterwards assigned to preserve it, until it was ultimately transferred to Bangkok in 1779. It was formerly reported the image had been worked out of an emerald, it is however only green jasper.

The bridge which leads over the Meping seems of considerable age: (the river is here 380 feet wide, as I ascertained by measurement,) and although men, horses and cattle pass over it, the elephants have to ford the river. These animals are too heavy for such a frail structure, of which the greater number of planks that stretch across horizontally, are not even fixed by wooden pegs or iron nails. The clattering noise of these loose planks, when a drove of oxen is passing over the bridge, is almost stunning, and has repeatedly awaked me out of sleep at night, when sounds are so much more distinct than during day.

There are many cocoa and betel-nut trees in and around Xiengmai. Oil is prepared from the first, and the betel-nut forms an article of commerce, being exported from Xiengmai, after setting aside what is used for home consumption. Indeed the produce of the trees for export is far from sufficient for the more eastern and northern Lao states, where few or none of the palms that produce the nut grow; hence large quantities are brought from Pegu and the Tenasserim provinces. Both these kinds of palms, namely the cocoa and betel, seem to thrive very well at Xiengmai. While I was there, two dry cocoa-



nuts were brought to me, grown at Xiengmai, the one measuring 2 feet 8 inches, the other 2 feet 6 inches in circumference.

Shaddocks or pumplemose, oranges, citrons and limes, bananas, and plantains are likewise raised, but of the two first kinds of fruits I have scarcely found one of a good taste. The Viceroy whom I met at Bangkok, told me, that there was only a single mangosteen tree in Xiengmai, and that in consequence of the cold temperature, it was in a sickly state and seldom produced fruit. At the bazar a number of kitchen herbs, may, however, be found, such as cucumbers, onions, garlic, beans, and lettuce.

The customs of the Lao people resemble in general those of the Siamese. Marriage contracts are made verbally, the parents of the girl receiving a compensation from the future husband, for the loss which they suffer by having no further assistance from their daughter in their daily labour. The amount of that compensation depends upon the bride's beauty, youth and family connections. It seems the minimum is 40 Rupees (£4.)

They practise cremation for such as die of a natural death—that is, if the relations can pay the expenses connected with it—but the remains of such as lose life by accident, as by drowning, by a fall, or being killed by an animal, cannot be burned but must be interred.

The smoking of cigars is very common amongst the women—they sometimes use pipes which are made of the rhizoma or rootstock of the bamboo, nicely carved. Little girls, no more than 6 or 7 years of age imitate their elders. It is quite amusing to see with what gravity these children enjoy their weed. On the other hand, I have not seen that the Lao females use the betel-nut to the same extent as the Siamese: hence, as I have already observed, they do not show those distorted mouths which disfigure the sex in Bangkok, and render their teeth black and corroded.

On the north-eastern angle of the town is an extensive marshy ground. During the rainy season it forms a large expanse of water which has given rise to the accounts that prevailed in the 17th and 18th century, that it was a large lake, something like the fabled lake of Parince of the western continent, a kind of Caspian, and that the Menam flowed out of it.

This famous lake which owes its existence to the low level of ground and its waters to the accumulation of rain or the overflowing

of the Méping which flows at a short distance, is frequented by a large number of wading birds, namely waterfowls, ducks, teal, egrets, and a kind of swan-goose. Nor is the Nock Bua wanting; and occasionally a *Karen bird*, the flesh of its breast yielding excellent steaks, may be shot there.

Amongst the articles which I saw carried for sale to the bazar, are large rolls of paper of the usual Siamese kind. It is prepared from the bark of two different kinds of trees, (one of which is the Ton Kain of the Siamese). Each roll of the manufactured paper consists of 3 sheets, 5 feet long and 2 feet 7 inches broad. Such a roll is sold at the rate of the eighth of a rupee or about three pence. They give it sometimes a greenish or bluish tint, but in general it is of a dusky white.

Chao Operat had expressed a wish to present some gifts, according to Lao custom to the young princes Ong Teng and Ong Sawa who were with me. The ceremony took place in the large Sala adjacent to our residence. The Deputy Viceroy did not come himself, but sent one of his high nobles accompanied by some other officers of rank.

Two pyramids of flowers, consisting of three rows, one above the other, but each smaller than the preceding and the whole about 5 feet high, were carried before the procession—then came two smaller ones, of more intrinsic value, each of the branchlets of the pyramids ending in a kind of network with a rupee in it. There were 50 of these on one tree, and 49 on the other, the missing one having probably found its way to the fob of one of the attendants, or rather to the corner of his girdle.

The pyramids having been placed in the middle of the Sala, a number of dishes with legs of pork, fowls, fish, eggs, fruits, vegetables, &c., were placed around them. Ong Teng and Ong Sawa squatted on the ground near the pyramids; one of the noblemen then stepped forward, and having seated himself near the young princes, he made his salaam and took a book out of his girdle, and read a homily or prayer of ten tedious pages, addressed to Buddha, invoking him to protect the young princes during their journey, and to vouchsafe their safe return to their parents and friends. The prayer finished, he tore down one of the long cotton threads which were hanging from the branches of the larger pyramids, and taking the end part, about four inches in length, in his hands, he passed the rest from the wrist of Ong Teng to the end of the boy's forefinger, murmuring all the time some sentence or incantation—he then tore off the short end which he had kept in his hand,

and threw it away, for in it according to their superstition all the evil was embodied, winding, as already mentioned, the long part of the thread around the wrist as a talisman. The same operation was gone through with the left hand. Some of the noblemen who were present followed his example, and the second prince Ong Sawa having been performed upon in a similar manner, the ceremony was over. Not the slightest decorum was observed during it, the people present talking, smoking, and making jokes while the exhortation was being read.

I had observed at a short distance between our residence and the city wall, two monuments or resting-places of the dead, surrounded by a railing and kept in good order. It was entirely an accident that I addressed the Chao Ratcheput who was close to me in the Sala when the ceremony took place, asking him whose graves they were. "They are those of my parents," he said, "their ashes after cremation had taken place, were interred here. Twice a year I come to put flowers over their graves, and have the railing restored."

I thought that this care bestowed upon the resting-place of his parents showed as deep an affection as the temples erected by the high nobility and the opulent in Bangkok, over the graves of their nearest relations.

Our delay at Xiengmai became irksome. Chao Operat put all possible difficulties in the way of our departure. In consequence of his detaining some British subjects against their will in Xiengmai, I had some differences with him and from that time none of the persons who had been previously so friendly with us, ventured to come near us—nay, we even found difficulties in purchasing provisions, the people being afraid to sell to us. After repeated delays we got under way at last on the 27th of February, having been detained thirteen days in Xiengmai. The number of elephants at starting was not complete and Chao Operat refused obstinately to let us have any horses, although it was expressly mentioned in the king's letter. It was then that Chao-puri-eatenah, seeing our disappointment, presented to Mr. Clarke and myself, each a pony of his own stud, so that we might occasionally relieve the monotony and hardship of elephant riding. I felt grateful to the donor, and brought the pony safely with me to Bangkok.

I shall now hurry on to the conclusion. The number of elephants was ultimately increased to 39—our escort consisted of 55 soldiers and 85

persons to attend to the elephants, carriers, &c., indeed ourselves included and the boatmen from Bangkok, we mustered 150 men. We had to traverse the regions infested by the Red Karens, a wild and predatory Indian tribe, who had recently been very troublesome; hence so numerous an escort was requisite.

Although we had not received much courtesy and attention from the Operat while in Xiengmai, he had by all means exercised his authority under the King's letter, and as long as we travelled in the Siamese territory, we found comfortable night quarters erected, when arriving at our halting-place, a party having been always sent in advance for that purpose.

The journey from Xiengmai to Maulmain occupied us twenty-four days; from thence we went by steamer to Tavoy, and again resorting to elephants for our transport, we crossed the great Central mountain ridge, which being a spur of the great Himalaya, traverses the Malay Peninsula, and ends at Cape Romania. We had a journey of eight days from Tavoy to the mouth of the Menam noi where that rivulet falls into the Canbari river near Chai-Yoke. Our journey from Tavoy to Chai-Yoke occupied eight days, the report that it is only a distance of a couple of days is erroneous. At last we arrived safely at Bankok.

We had been absent from it 135 days, 86 of which found us under way.

We felt very grateful that our journey had been accomplished without any further drawback than the loss of nearly all that I had collected in illustration of Natural History. Five days of almost incessant rains during our journey from Tavoy to the central mountain ridge, was sufficient to defy the precautions which had been taken to secure my gatherings: moreover in lieu of the nice howdees which we had in our journey from Xiengmai, here we had miserable structures, only to be compared to the crates in which earthenware is packed, and open to the whole influence of the weather. During the period that we had to undergo this ordeal, the order of the day was, that every one of us, previous to the morning's cup of coffee being served, had to take two grains of quinine in a wine-glass full of water—and to this remedy next to God's will, I ascribe it, that all of us escaped the pernicious jungle fever, more fatal to Europeans and Americans at the setting in of the rainy season than at any other time.

*\*Notes on the Tribes of the Eastern Frontier, No. I.—By J. H. O'DONEL, Esq., Revenue Surveyor of Arracan.*

*(Communicated by A. GROTE, Esq.)*

The Survey of the northern portion of the Akyab district and the remaining portion of the frontier bordering on Chittagong was finished in March last. A high range of hills, called Modooting, Mrancedong and Yandong forms a natural boundary between the two districts. Opposite Tulukmee the altitude is about 2,500 feet, farther north the altitude increases to 5,000 feet at Yandong. To the eastward of this boundary range the Koladyne river flows at a distance of 10 to 16 miles. From Tulukmee northwards and within 12 miles along the banks of the river, there are 6 villages on the right bank and four on the left bank: no other villages are met with higher up for 60 miles, the intermediate country being totally uninhabited. The Loosai Kookees reside on the west of the boundary range. The independent Shendoos occupy the tract of country to the east of the Koladyne river, from the mouth of the Sulla Kheong northwards. Further north, to the 23rd parallel of north latitude, the country is occupied by the independent tribes of Muneepoor, Arracan and Ava; there is no recognised frontier in that direction and it will be necessary to fix a frontier line after the survey towards the Yeomadoung range is finished.

In 1851 Captain Tickell proceeded as far as Tulukmee and tried to induce the Khoomee Chiefs to come in. From his published Journal, it appears that 4 or 5 subordinate chiefs attended, but the heads of the most powerful clans made excuses. It was not however till the last cold season that the first attempt was made to explore the country on the Upper Koladyne, occupied by fierce wild tribes, who have for years committed periodical aggressions on the inhabitants of the lower hills and lowland border villages both in the Akyab and Chittagong districts. In April and May 1859, several dacoities were committed on the Myo river and within the northern lowland circles on the Koladyne; many persons were killed, and their wives and children carried away as slaves and sold. In Dec. 1859 a dacoity was committed 5 miles from my camp at Ralla. The coolies were so alarmed, that a few days after, most of them deserted.

\* Extract from a letter to the Commissioner of Arracan.

The Koladyne circle includes within its limits an area of 2,652 square miles. The population consists of Kheongthas, Mroos, Khoomees and Shendoos, all distinguished from the people of the plains by peculiar usages. The Kheongthas live in 9 villages, intermixed with the Khoomees far apart from each other: they number 713 souls. Of these, 189 are cultivators who pay 5 Rs. each annually, 1 Rupee land rent and 4 Rupees capitation tax. The Mroos occupy 12 villages on the Mee Kheong all within 8 miles of Koladyne Thannah; they number 839 souls; of these 136 are cultivators who pay 3 Rupees each annually. Both Kheongthas and Mroos are in general quiet, inoffensive people, similar to the Joomeea Mughls. Tulukmee is a Kheongtha village with thirty houses; during the day the people live on land, but at night they occupy large substantial floating huts moved into the middle of the stream, being afraid of the secret and sudden attacks made by their wild neighbours.

The Khoomees, the largest and most important of the hill tribes in Arracan, occupy the country on both banks of the Koladyne river, from the thannah to the mouth of the Sulla Kheong. Their chief occupation apparently is agricultural industry and they manufacture cloths, spears and gunpowder. All or nearly all practise dacoity. They do not acknowledge the authority of any Rajah or paramount chief, and although they respect and obey their own village chiefs and heads of clans, each chieftain is in some measure under the control of the confederate chiefs. They are divided into 27 clans, who occupy 104 villages, and the estimated number of inhabitants is about 12,000 souls, over whom our authority has never been practically established. The spear and shield are sometimes used, but all adult males are armed with muskets kept clean and ready for use. The most powerful clans, Khoongchoo, Khoong, Anoo, and Yeasing are called Shendoos, they reside on the higher ranges distant from the river, and pay no revenue; those living towards Tulukmee speak a different language from the southern Khoomees. The Keok collects annually about 608 Rs. as land rent, &c., from the Khoomees. The total amount annually collected from Kheongthas, Mroos, and Khoomees is 2,165 Rupees. The independent Shendoos, called Poehs by the Muneepoorees, occupy the lofty and distant ranges on the eastern bank of the Koladyne, northwards from the mouth of the Sulla Kheong. They are held in great dread both by the Khoomees and other hill people living lower

down. They speak a different language, understood only by a few of the nearest Khoomees with whom they barter cloths and other articles. Several Shendooes were slain in an attempt to levy black mail, and within the last 2 years there has been little or no intercourse between them. Being at feud with each other, no accurate information could be obtained of the population or the precise limits of the Shendoo country.

My best endeavours have been directed to carry out the instructions contained in your letter No. 348 of the 12th October, 1859. I was always of opinion that without kindness and conciliatory measures, there was not the slightest chance of my being able to complete the duties entrusted to me in a satisfactory manner. I availed myself of every opportunity to reconcile the people of one village with another with whom they are at feud. Rangkreegree and Kaffa, village chiefs of the same clan, are the only two Khoomees now at feud with each other; this is a blood-feud, and it is not likely it will ever be adjusted till both become better men. There are no other internal feuds among the different clans of Khoomees. For the first two months of my stay in the hills, my proceedings were viewed with apprehensive jealousy by the chiefs Mounghkhine, chief of the clan Yeasing who had committed dacoities near the thannah a few years ago, at first objected to my parties surveying near his village, but some months after, finding that all the most influential chiefs had paid their respects to me, he offered no further resistance.

You are well aware that the Khoomees have always avoided any intercourse with the local authorities. Military expeditions had failed in effectually putting down their inroads, for the troops seldom penetrated beyond a short distance from the thannah, the country being most difficult of access. Before the troops reached the villages to be attacked, the robbers received timely notice, and deserted their villages, taking away their families with them. There are no paths, and the hills being covered with lofty forest, no guides would venture to assist in making a search for fear of their lives. We knew nothing definitely of the most distant clans who are separated by language, manners, prejudices of race, and a most difficult hilly country, from the neighbouring population. One of the leading points therefore, to which my attention was directed, was to induce the chiefs to meet me, so as to ascertain from them, how they propose that the system of dacoity and

marauding, which they all practise to a great extent, might be put down. I found it at first most difficult to induce the most powerful chiefs to meet me, and to remove the general dread and distrust that prevailed. At the first conference, to quiet their fears, I fully explained that my intentions were peaceable, and that my object was to survey and make a map of the country. I also explained to them that dacoity would in future be promptly and severely punished, and asked them how they proposed to put a stop to the same, appealing to the oldest chiefs, who seemed to possess considerable influence over the others. Many of them indignantly denied that they were robber chiefs; others were noisy, and put their hands to their sides, to feel they had daggers to defend themselves in case of treachery. After urging all the arguments I could think of, I broke up the conference, advising them to reconsider the subject more at leisure, and to let me know the result hereafter. Some weeks after, Thambway, a chief of one of the largest clans, offered to serve as Frontier Police Sirdar. Considering that our Police stationed at the thannah, is perfectly useless in preventing dacoities or apprehending offenders, unless supported by a large Military force, I brought the subject to your notice, and recommended the chief for employment. The chief object in the plundering expeditions is to obtain slaves. The village attacked is surrounded at night, and generally set on fire, or a volley of muskets is fired into it. The inhabitants, as they leave their burning houses, are seized, the males are speared, and the women and children carried away into slavery. In the distribution of plunder and slaves, they are guided by their own recognised rules. The leader of the expedition receives a double share, the petty leaders a share each, and their followers generally the plunder secured by each individual. Adult males are difficult to manage, and are invariably killed. The captive women and children are employed as domestic servants, and considered valuable property: 200 Rupees is generally demanded as ransom for each captive. During the period of my stay in the Hills, for 4 months, with one exception, the most perfect harmony prevailed between my party and the surrounding chiefs of banditti. For several months previous, the Police had attempted to recover several captives and were unsuccessful; when I was about leaving Tulukmee, at the earnest intercession of their relatives, I obtained all the 12 captives, valued at 2,400 Rupees, through the clan influence of the chiefs, four of whom were, on my re-



commendation, rewarded for their good services. I trust the manner in which I have carried out your instructions to restore confidence amongst the lowland people, whose lives and property were exposed to attack, will meet with your approval.

The work of the current season will include the unfinished portion of the district, from the Bay of Bengal and Lemroo river on the west, to the Yeomadoung range of Hills on the Ava frontier. The Keoks of the two frontier circles, Tandan and Lemroo, have informed me, that in addition to the wild Khengs, there are several villages of Burmese dacoits, (living within their circles paying no revenue, and saying they are subjects of Ava,) who, it is likely, will oppose my proceedings on the frontier.

*\*Notes on the Tribes of the Eastern Frontier, No. II.—By J. H. O'DONEL, Esq., Revenue Surveyor of Arracan.*

*(Communicated by A. GROTE, Esq.)*

The Eastern portion of the district from the Yeomadoung to the Lemroo river is mountainous and hilly. The lowlands are situated chiefly on the west of the Lemroo river, and on the east of the same river there is a narrow belt of lowland, 50 miles in length, and from 1 to 4 miles in breadth. The hill tribes living on our eastern frontier are Khyens, Mrookhyens, and Koos.

KHYENS.—The Khyens differ from the Burmese in dress, language and habits : they occupy both banks of the Lemroo river from the Wah Kheong to the Khee Kheong and the low hills west of the Jegaendong range visible from the plains, the valley of the Taroce Khcong and the low hills and plains within the Tandan, Gnacharain, Prwanrhay and Dainboong circles. They are a quiet inoffensive people and number 3,304 souls who pay land revenue and capitation tax to the amount of Rs. 3,883. Several Khyens have settled down as permanent lowland cultivators, where they have been driven to the necessity of cultivating the fields, to avoid the violence and periodical aggressions of the neighbouring wild people ; those living on the west of the Lemroo river, consider that broad river as a sufficient protection. The males frequently go almost naked, having a rag fastened by a string in front

\* Extract from a letter to the Commissioner of Arrakan.

of the lower part of the body: occasionally they wear a chang as a cloak to cover the body. The dress of the females consists of a dark blue cotton gown, fastened at the neck and descending to the knees. The faces of the women are all tattooed, and it gives them a singularly hideous appearance: the tattooing commences with a circle in the forehead and a straight line bisects it, extending to the nose: curved lines are made along each cheek, converging towards the chin, where they end in a circle: the outer line forms a curious edging as if the face was covered with a mask. Figures of animals are sometimes tattooed as ornaments; these marks and figures are made by pressing sharp points into the flesh, and filling the punctures with a liquid, prepared from the juice of a tree found in the forests. The operation is so painful, that young girls of 8 or 10 years are obliged to be tied down, their faces remain swollen for a fortnight afterwards. From 5 to 30 Rs. is generally paid for disfiguring the faces of young females.

**MROO KHYENS.**—The most northern village, occupied by the Mroo Khyens paying revenue, is Sikcharoa, situated 14 miles north of the junction of the Saeng Kheong with the Lemroo river. The Mroo Khyens occupy the valleys of the Wah Kheong, Saeng Kheong, Mau Kheong and that part of the valley of the Lemroo between Peng Kheong and Saeng Kheong. They number 4,020 souls, of whom 37 cultivators pay an annual revenue of Rs. 111. This small revenue is chiefly derived from the sale of bamboos, which are floated down in rafts of 10,000 or more, and sold in the plains at 1 Rupee the hundred. The village of Anoongroa is a refuge for deformed, maimed, and all sick persons labouring under palsy, ulcers, leprosy and other incurable diseases. Some who recover, cultivate for themselves, but in general they are supported by their relatives, who consider them outcasts: they are not allowed to beg, and would on no account receive shelter in any other villages.

The inhabitants of Hytweegree and the villages on the heights near the Mau Kheong pass,\* situated several miles within our frontier, would not render me any assistance or receive presents, being afraid of the barbarous and cruel punishments inflicted by the Burmese. A Burmese official resides at Loong-shai-mroo, 2 days' journey on the Ava side of the boundary range. He collects annually from each of these villages, one male or female slave valued from 50 to 100 Rs. and

\* Kangto, Thonoo, Atareepoong, Okreepoong.

a chang or covering from each house, valued at 1 Rupee. Although they pay readily whatever is demanded from them by the Burmese, they do not hesitate to levy black mail from the few travellers who attempt to pass by this route over the Yeomadoung at Kooeelandong, (5924 feet high,) to purchase cattle from Burmah proper. They did not however offer any opposition to the survey parties employed in this direction. The high central ridge of the Yeomadoung is a distinct natural boundary, and there is no doubt that the villages named above are situated within the limits of the Akyab district.

Koos.—The Koos occupy the mountainous country near the sources of the Lemroo river and its principal feeder the Peng Kheong, within the 22nd parallel of north latitude, westward of the Yeomadoung range; they have never paid any revenue and it is only after entering the hills for 8 or 10 days, that the first villages of these wild people are met with. The approximate number of houses is 2397, and allowing 5 persons for each house, the number of inhabitants may be estimated at about 14,485. Those living on the Peng Kheong have intercourse with the neighbouring Khoomees of the Koladyne circle, from whom they differ but little in their habits. On occasions of rejoicing, the latter amuse themselves by dancing round a bull or gayal tied down to a stake. As they dance round and round the animal is slowly despatched by numberless spear wounds, aimed at every part of its body. Bamboo cups are applied to the wounds; men, women and children drink the blood. Beyond vague information that the Koos exceeded the Khoomees in their barbarous practices, by torturing human creatures in the same manner, nothing was known of them. Revenge may occasionally be gratified in this cruel manner, but the practice is not common, nor could I obtain any information on the subject. The Koos living on the Lemroo river are perfectly wild and at feud with each other. Interpreters and guides from the nearest M̄oo Khyen villages could not be obtained; they would not accept of presents, stating that it was as much as their lives were worth, to attempt proceeding higher up the river. Three attempts were however made to proceed a few miles beyond Khopatong hill station; twice the Khyen coolies deserted, and the third time they resolutely refused to proceed, and said they would again desert, if another attempt was made. The direction of the Hill stations was changed more to the westward, and the triangulation was carried on along the heights bordering on the Peng

Kheong. The Koos being unacquainted with the use of salt, their food is extremely insipid and the smallness of their appetite was noticed. Their chief food is Indian corn. Like the Khyens and Mroo Khyens, they wear but little clothing. Canes slit in two and painted red are wrapped round the stomach about 20 times, as a protection from poisonous arrow wounds. Muskets are common amongst the Koos of the Peng Kheong. Spears, bows and arrows, manufactured by themselves, are the other weapons used.

The Khyens made no complaints about any of their villages being attacked by Hill robbers or of any of their number being carried away as slaves. Cattles are, however, frequently stolen.

The only route by which the Hills can be entered, is the bed of the Lemroo river, which, in the upper part of its course, is a mountain torrent, and admits only of canoes of the smallest size. There is a waterfall 4 miles above the village of Goonguen or Lemroo, and after the first day's journey, falls and rapids are met with almost at every mile and sometimes oftener. The principal feeders of the Lemroo are the Peng Kheong, Saeng Kheong, Wap Kheong, Mau Kheong and Saroece Kheong. Canoes are used on these streams for short distances from their junctions with the main stream.

*Notes on the Tribes of the Eastern Frontier, No. III.—By H. J. REYNOLDS, Esq.*

*(Communicated by A. GROTE, Esq.)*

I have alluded in my 8th para.\* to the existence of several Kookie villages near the boundary line. I was told that there are 18 such villages, and I have myself visited 7 of them, all of which are within the British territory. As these hills have perhaps never before been traversed by an Officer of Government, a few remarks respecting these hill people may not be out of place. I have above spoken of them as Kookies; but the name is not properly applicable to these people, who are an entirely different race from the Kookies of the Chittagong jungles. The name by which they are commonly known is "Tipperahs." In physiognomy some of them are like the Muni-poorees, but the greater part bear more resemblance to the Khasiah

\* In a foregoing portion of the letter from which the above is extracted.

tribes, having strongly marked Calmuck, or Mongolian features, with flat faces and thick lips. Those whom I saw were not in general shorter in stature than Bengalis, and were far more muscular and strongly made. I was struck, with the fair complexions of many of them, scarcely darker than a swarthy European. The villages which I visited contained perhaps from 100 to 200 inhabitants each, and each house is raised on bamboo piles 4 or 5 feet from the ground. This is done, as I was told, partly as a protection against wild beasts, and partly to keep the houses out of the reach of floods after a heavy rain; (I may remark, that though I heard a good deal of wild animals being numerous upon these hills, yet I saw none whatever; indeed the hills appeared to be remarkably bare of life, even birds being very scarce.) The "Tipperahs" understand and speak Bengali, the better class of them correctly enough and the lower class imperfectly: but they conversed with each other in a dialect of their own, which none of my party understood. They appear to maintain no caste restrictions, and eat any kind of food; even taking with perfect readiness some which I offered them. They keep pigs, fowls and pigeons, but they do not seem to have any bullocks, nor did I see any ploughs in their villages. They cultivate cotton and rice upon patches of the hills which they clear of jungle. They pay no rent, I was informed, for the lands they occupy; but they pay a nuzzer of one rupee to the Rajah of Tipperah upon every occasion of a marriage among them.

*Aornos.—By Lt.-Col. J. ABBOTT.*

In the Asiatic Society's Journal No. 1 of 1863 I have lately perused an interesting paper by the Rev. I. Loewenthal upon the antiquities of the Peshawur district, of which I hope to see many more numbers. My object in noticing it at present, is less to support my own theory regarding the site of Aornos, which does not appear to me to be shaken, than to invite attention generally to the subject and others connected with the footsteps of the Greeks; whose coins and sculpture abound in all old sites of the Peshawur district and in a large number of those between the Jelum and Atuk. Not only is this ground classical to us Europeans; it is also the classical soil of the Hindoo—the Eusufzye and the valley of Sohaut containing many of the old sites spoken of in the heroic poems of that race.

At page 13 of Mr. Loewenthal's essay he calls in question the locality I have assigned for Aornos, upon the verdict of some great Military authority (unknown) because "the Mahabunn commands nothing, and is so much out of the way, that it could hardly ever have been a place of refuge for the people of the plains, and if it had been, a general like Alexander would not have wasted his time on the reduction of an isolated hill which was by no means impeding his passage to the Indus."

Now at first sight all this may appear to be sound argument. It is only when we find that not a single position agrees with fact, that we regret the rashness of great Military authorities, in deciding, without investigation, questions so perplexing as this.

First, it is stated, that the Mahabunn commands nothing.

I answer, that it commands the liberties of the most warlike of the tribes in the Peshawur valley; the Aspasioi, or Asupzye, as they still term themselves. So long as Aornos was free, the Aspasioi could not be conquered. And as long as the Mahabunn is free, the Asupzye can never be subdued. Their villages may be occupied at great expense by armed garrisons: but sooner or later those garrisons will be cut off, and the people will reassert their freedom. It was this certainty, (in all probability,) which led Hercules four thousand years ago to assail Aornos. And it was possibly the same assurance, that, (after an interval of 2000 years,) conspiring with his emulation of the heroes of antiquity, prompted Alexander to the same undertaking with better success.

Secondly, it is asserted that the Mahabunn "is too far out of the way to have been a refuge to the people of the plains." But this is contrary to fact; for the Mahabunn, which includes a vast tract of forest-belted mountain, ever has been, as it still is, and always must be, the retreat to which the Aspasioi (Asupzye) when invaded, drive their flocks and herds and carry their women and children: its very distance, (to an invader, for it is not very distant for them) forming one of the especial reasons for its selection. Not only did Hercules and Alexander (if the Mahabunn be Aornos) find it necessary to assail this stupendous mountain, but Nadir Shah himself could not reduce the Eusufzye to submission, until he had crowned the summit with his army. Hercules (we learn from Curtius and Diodoros) made earthquakes and heavenly portents his plea for abandoning the siege. His real reason, probably, was that, less provident than the son of Philip, he found his supplies cut off and the prosecution of the siege impossible. It is *because* the Mahabunn is the immemorial retreat of the Aspasioi of the plains when overmatched, that I was first led to enquire whether it might not be Aornos.

Thirdly, it is objected, that "had the Mahabunn been the refuge of the people of the plains, a General like Alexander would not have wasted his time on the reduction of an isolated hill, which was by no means impeding his passage to the Indus."

Had it been said "a General like Napoleon or Wellington or Marlborough," the rashness of this remark had been less obvious. But Alexander differed from all other great generals in this, that his love of conquest was rivalled by his ambition to excel the heroes and demigods of antiquity. Neither Napoleon nor Marlborough nor Wellington, probably, would have headed the forlorn hope in storming like a common grenadier a mud-walled town, which any of his Captains could have reduced in a week. Yet we are obliged to believe that Alexander did this; nor can we well believe that he attacked Aornos, without crediting what all his biographers assign as his reason, that it had resisted three assaults of Hercules. We must, moreover, remember that Alexander was already in possession of the Ferry of the Indus. He awaited the construction of boats, of which the timber\* must be

\* Ἐπει δὲ καὶ ὅλην ἐργασίαν ἐνέτυχε παρὰ τὸν ποταμὸν, καὶ αὕτη ἐκόπη αὐτῷ ὑπὸ τῆς στρατίας καὶ ναῦς ἐποίησαν. Arrian iv. 30.

felled in the Mahabunn, ere he could cross. He was not, therefore (as our great Military authority supposed,) in any hurry to approach the Indus ; but was steadily conquering the country of the Asufzye and the valley of Swat, conquering in order to retain possession, not merely to ravage and destroy. So that although it might have flattered his pride to dispute with Hercules the prize of valour, it was quite reconcileable with his prudence to reduce *that* stronghold, without which the Asupzye could never be effectually subdued,

Unless greatly mistaken, we have fully answered all the objections of the unknown Military authority. We now come to Mr. Loewenthal's reasons for thinking that the castle of Hodi near Atuk on the farther brink of the Indus is the veritable Aornos.

The unknown authority already quoted goes on to say, "The hill above Khyrabad is not only a most conspicuous point for friend and foe, but also one that must be taken before a passage of the Indus at Atuk would be attempted by an invading force."

The castle of Hodi is conspicuous enough ; it occupies the summit of a hill about 600 feet high, standing on the river's brink about a mile below the crossing. But as, according to Mr. Loewenthal's account, it could be entered only from the river side, a very small force would have sufficed to keep its garrison prisoners to their castle. And I must deny that any garrison, armed with spear, sword, shield, bow and arrow, could have impeded the crossing of such an army as Alexander's from Hodi's castle. Supposing, however, that this castle was then in existence, (of which there is not the slightest probability,) and that the Asupzye had fled thither from Bazira, Ora and the rest of the cities of the plains, Alexander might probably have deputed Ptolemy or one of his other Captains to reduce it. But we can see nothing in the castle itself, nor in the paltry hill on which it stands, to justify either the repulse of Hercules or the ambition of Alexander to be its captor.

The next supposed point of resemblance is its name. Its veritable name is Raja Hodi ki killa, the castle of Raja Hodi, and it has no other. But as Atuk is often called Benares Atuk, just as Chuch is called Chuch Benares, Mr. Loewenthal assumes that Raja Hodi's castle may have been called Benares, in order that it may be reduced, first to Varanas and from thence to Aornos. We think that such a chain of suppositions will scarcely answer to identify the contemptible hill



in question with the magnificent mountain described as Aornos. That the ancient name of the purgunna or tract on which Atuk rests was Benares is probable enough; but it seems to me that this Benares (whether city or tract) must have been on the same side of the river as Chuch, which to this day is called Chuch Benares. For the breadth of the Indus there, (upwards of two miles,) completely severs Chuch from the Eusufzye, and when Alexander visited them, he found them subject to two distinct sovereigns.

The name is variously pronounced as Bunnarr, Bunares, Bunass, the latter signifying "destruction."

We think it may serve an important end in the elucidation of this knotty question to record all the different accounts now extant of Aornos. Persons who do not possess the ancient authors treating upon the subject, may then visit the various possible sites and judge for themselves which was the tremendous rock that repulsed three attacks of Hercules, the greatest General of his age.

To begin with Arrian, who, in spite of Mr. Loewenthal's disparaging remarks, has left us one of the most succinct and detailed accounts ever penned, of this campaign, Aornos was a table mountain 14 miles in circuit at base, 4125 feet in height, extremely steep, having abundant water at the summit and numerous welling springs, plenty of wood, and soil for 1000 ploughs (should it be tilled). It was the refuge of all the cities of the plains, but especially of Bazira (Bajra) and Ora, (perhaps Ooud or Owra). The ascent to it was from Umb, Balima, (sites retaining this name at the foot of the Mahabunn). Although so steep, Alexander led up it a squadron of the companion horse, 20 mounted archers and his engines of war. Though the rock held by the enemy was so lofty, yet the mountain had still higher ground, which Ptolemy got possession of by the aid of a spy, attacking thence the enemy in rear. Alexander met none but natural obstacles, until he had ascended the mountain after 6 days' toil and incessant hand-to-hand combat. He then apparently reached a table summit, having soil, in which he dug his trench and raised his parapet of approach. Near the rock was a mound of equal height, which the Macedonians carried by assault. After which the garrison lost heart, and when Alexander withdrew his pickets, vacated the place by night. The rock on the table summit must of course have had parapets, or the enemy could not have held it an hour after Alexander's attainment of the table summit. But it was

not in itself very formidable, for Alexander and his companions scrambled up it without waiting for ladders.

This is the account of Arrian, generally the most faithful of historians. It has all the appearance of having been copied from the journal of an eye-witness: perhaps Ptolemy, perhaps Beton, Alexander's quartermaster, whose journal was published. According to him the difficulty of the enterprize was the exceeding courage of the defenders opposing Alexander on a very steep acclivity, which he was 6 days in surmounting. But walls or ditches are nowhere mentioned. The fidelity of the people in concealing from him the path by which such a wilderness of mountain might be safely entered, was amongst the foremost difficulties. A foreigner who had long resided there was his guide, bribed by a large sum\* of money. This is Arrian's account, and should any one have to attack the Mahabunn, Arrian would serve him as a guide step by step.

We next come to Strabo's very meagre notice of Aornos. "Alexander had taken, in the first assault, a certain rock called Aornos, whose roots the Indus, not far from its springs, washes."

Next follows Curtius, whose account is so diametrically opposite to that of Arrian, that it is necessary to choose the one and reject the other. I am not singular in siding with Arrian, whose detailed narrative is as sober as Curtius' is wild and inflated. Curtius describes the rock Aornos as having the figure of a goal, terminating above in a sharp pinnacle, its roots being entered by the river Indus, scarped on both sides by lofty rocks. On the other hand were interposed gulfs and quagmires, which Alexander filled, by felling and casting in a forest; a work of 7 days. The assailants who were repulsed, fell into the Indus, as the garrison rolled down upon them rocky fragments. The repulse was signal, but as Alexander showed no symptom of abandoning the siege, the Indians after a while evacuated the rock. This rock was near Ora and one march from Ek-bolima, beyond which was a defile: after which he reached the Indus in 16 marches, and found all prepared for crossing.

No mention is made of walls to this Fort. In fact, supposing it to have had the figure of a Roman goal as above described, walls had been utterly superfluous, and its name of Aornos had been well deserved.

\* 80 Talents.

Diodoros' account is as follows. Aornos was the refuge of the people of the plains. (The loss of a portion of the narrative prevents our knowing the names of the cities from which the garrison had fled.) It was excessively steep; and Hercules had desisted from the siege, owing to earthquakes and heavenly portents. This rock had a circuit of  $8\frac{1}{2}$  miles, an elevation of 10,560 feet and its surface was every where smooth and taper; being washed at the South by the river Indus. Elsewhere it was girt with deep ravines and was difficult with precipices. A foreigner of destitute circumstances led him to a post which gave him the upper hand of the garrison, and commanded its only outlet. Alexander therefore, having blockaded the rock, filled with earth its chasm and roots and pressed the siege incessantly 7 days and 7 nights: when, conjecturing that the garrison had lost heart, he withdrew his guard from the outlet, and the barbarians evacuated the rock by night.

Several points in this account agree with that of Curtius, who probably took much of his narrative from Diodoros. All three agree in one fact, however they may differ in others; viz. that Aornos was fortified by nature alone and not by human art. Whatever therefore the site to be considered, it must be one, almost impregnable by nature if well defended, and destitute of artificial defences, excepting of course that rude parapet of loose stones or earth, which barbarous nations from the earliest days have employed. Diodoros makes no mention of the assailants being hurled into the Indus. This appears to be a pure invention of Curtius, deduced from the fact that the Indus washes the roots of the mountain. Arrian's and Diodoros's accounts do not differ very materially, if we consider the six days' ascent of the mountain (so circumstantially described by Arrian,) and the ambush of Ptolemy to be embraced by Diodoros in his brief statement, that a foreigner for reward led Alexander where he commanded the only access to the rock. To Curtius, generalship was nothing: courage and dash every thing. The mountain up which Alexander, with consummate skill, fought step by step for six days, was far too prosaic for his page. He makes it rise out of the river like a Roman goal and then he makes Alexander fell forests to build a ramp up to the summit. All of a sudden we stumble upon Diodoros, who estimates its perpendicular height at 10,000 feet or 2 miles; and then we wonder whence forests could be had sufficient for the work, or hands to fell and pile them up in six days.

We know of no other ancient accounts of Aornos beside those just now quoted. When Plutarch wrote, there were 16 different histories of Alexander's exploits, every one of which has perished. Plutarch himself offers no account of this siege, excepting the words of encouragement which Alexander offered to a leader of one of the storming parties of his own name. We have therefore, I believe, collated together all that is authentic relating to Aornos.

From these it appears that in our search for Aornos the following particulars must absolutely be borne in mind ; two of the three authorities agreeing together in all.

That Aornos was on the right bank of the Indus, near the cities Masaga, Oora, Bazira and Em-bolima.

That it was the place of refuge of the dense population of the plains, including that of the cities aforesaid.

That its defences were not artificial but natural.

That its perpendicular height was very considerable, being rated by one historian at 10,000 feet, by the other at 4,000.

That it abounded in forest.

That, high as stood the rock itself, the mountain which it crowned had yet higher ground.

That when the mountain summit had been won, and the rock confronted, the extraordinary danger to the besiegers was past.

Now, in considering Hodi's hill,—if it be the Aornos we are seeking, all the fortifications which now render it formidable must have been built since Alexander's day ; and therefore we must imagine the hill stript of them before asking whether this be Aornos. Would Mr. Loewenthal really believe that one born and nurtured amongst the wild mountains of Macedonia, who had stormed Tyre, carried some tremendous natural strongholds in Bactria and in the Buktari mountains, and had just crossed twice the Hindu Koosh, with all his engines of war, would have felt much piqued by the fame of a hill some six or seven hundred feet high, little differing from thousands around him,—a hill, too, which from the river side at least (for I have a faithful sketch of it from Attok) is perfectly accessible from base to summit.

If this hill be Aornos, we have also to discover south of the Loondi or Cabul river, sites answering to the cities Bazira, Oora, Masaga and Embolima. For fugitives from the Eusufzye could not have fled to

the hill of Hodi's castle ; being intercepted by the strong column under Craterus, marching from Peshawur direct to Atuk, to prepare boats for the transit across the Indus. This column, on its way, took and fortified the city Orobatis on the Northern side of the Loondi. This city I discovered in ruins, under the name Arabutt. The sites Bajra, Ooria, Moosagurh, Umb-balimah near the roots of Mahabunn answer well to the sites that must be found near Aornos, but I have heard of none such being discovered\* near Atuk.

Thus then stands the case, Raja Hodi's hill is recommended as being near the main ferry of the Indus, and on the river's brink where scarped with abrupt rocks, although no man struck down in ascending it, could possibly fall into the Indus as Curtius supposes they fell from Aornos.

It is liable to objection, as not being near Embolima, Oora, Bazira, or Massaga. As not being suited to shelter the people of the plains or their cattle, having no grass and little water, and being within an hour's march of the main road. Its only known name cannot by any ingenuity be converted into Aornos. It does not in the slightest degree resemble a Roman goal, being perfectly accessible from base to summit on the river face. Its height is not a fourth of that reckoned by Arrian, nor a tenth of the height assigned to Aornos by Diodoros. Being visible from base to summit from Atuk, Alexander could never have required a guide at an expenditure of 80 talents, to show him the road up. It has at summit no ground on which the 220 Horse which accompanied Alexander up Aornos could act. Nor can we imagine any reason why it should be called the Rock, being no more formidable, no *less* accessible than thousands of scrubby hills of like figure scattered all over Asia.

When (according to Arrian,) the fortified hill city Bazira had been evacuated by its defenders, who fled with others of the plains for refuge to Aornos, and when Alexander, fired with emulation of his great ancestor Hercules, had determined upon attacking that rock ; he established garrisons in the cities Ora and Massaga, and secured with a wall the city Bazira. Meanwhile Hephaistion and Perdikkas, whom he had despatched from Nikaia, (Jullalabad,) direct to Peshawur and the river Indus, walled and garrisoned Orobatis (Arabutt on north bank of Loondi) and reached the Indus to prepare boats for

\* There is a Bazaar, not very far from the Loondi river, but it is on a flat and Bajira was built on a hill, &c.

the passage across. Alexander, who had come through the country of the Aspasioi (Issupzye) and Gouraioi and Assakanoi,\* (people of Punjgour and Swaut,) to Bazira, leaving this town, and subduing some others on the Indus, came to Embolima at the foot of Aornos.

Had Alexander marched towards Atuk where Hodi's hill is sited, he had not sent half his army† with Hephaistioon and Perdikkas, as he would have been himself close in rear to support them. But he had gone through the countries of the Punjgour, the Assazye and Asup or Issupzye, and rejoined Hephaistioon after the siege of Aornos by a march of‡ 16 stages: proving manifestly that Aornos was no where near the crossing of the Indus.

Were Raja Hodi's hill, when divested of its fortifications, a stronghold calculated to have thrice foiled the greatest General of his age, and to be regarded as the greatest capture of Alexander; it would be time enough I think, to enquire whether its name had ever been Benares or any thing else convertible by etymologists into Aornos.

Mountains quite worthy of Hercules and of Alexander overshadow the Indus above the plain of the Aspasioi. Whether Mount Wunj (Aonj) the most difficult of these, and which, according to tradition, was not violated even by Alexander, be Aornos, or whether it be the Mahabunn, which more exactly suits Arrian's description, I must leave to be determined by after research. In the case of the Mahabunn the name alone differs. Its title of "The Rock" it well deserves, as seen from the river side, being scarped by tremendous precipices at summit: and its name of "Mahabunn" or the mighty forest, may very possibly be a corruption of "Mahabutt," the mighty rock; even as we know from Jehangir's autobiography, the neighbouring mountain of Gundgurrh, to have been called in his day§ Gurrjgurrh or "the house of Thunder," and Huzara to have been called "Abisara."

Persons who first visit Atuk, look up at once to Hodi's castle and if they have not Arrian beside them, naturally ask, may not that be Aornos? But after considering the contemptible nature of the hill,

\* Assakanoi are no doubt the Assuzyo or sons of Assa who inhabit Swaut.

† *εχοντας την τε Γοργιον ταξιν και Κλειτου και Μελεαγρου και των εταιρων ιππεων τους ημισεας, και τους μισθοφορους ιππεις συμπαντας.* Arrian iv. 22.

‡ *Inde processit Ekholima, &c.* Hinc ad flumen Indum sextis decimis castris pervenit. Curtius VIII. 12, i. e., to the crossing of the Indus. For he had just descended Aornos which is on the Indus.

§ From the thunderous sound which seems at times to proceed from its summit, but is probably the reflection of a sound generated high up in the river channel.

and comparing it with the stupendous mountains overshadowing the Indus, forty miles higher, they wonder that they should ever have entertained the idea.

Those who would wish to see the subject discussed at length, I beg to refer to my paper in the XXIII Vol. of the Asiatic Society's Journal, entitled "Gradus ad Aornon."\*

I beg to take this opportunity of correcting the following note which occurs in the paper aforesaid. It relates to my rendering of a passage of Curtius.

"*Note.* This passage 'Hanc (*i. e.* petram) ab Hercule frustra obsessam esse, terræque motu coactum absistere fama vulgaverat' is obscure: the word *coactum* agreeing neither with *Hercule*, nor with *petram*. I would suggest its being read '*coactam*,' which reconciles the difficulty: and after consideration I have adopted this reading. Our respect for *Hercules* would not improve, could we think him one to have been terrified by an earthquake."

When the above was written I had not consulted *Diodoros*, which now lies before me. He repeats the tradition in better grammar.

λέγεται γὰρ τον παλαιὸν Ἡρακλέα ταύτην τὴν πέτραν ἐπιβαλόμενον πολιορκεῖν ἀποστήναι διὰ τινὰς ἐπιγενομένους μεγάλους σεισμούς καὶ διοσημείας. Lib. XVII. πε.

Now *Hercules* might have been a very stout fellow and have knocked out other men's brains without boasting any of his own. But he could not have been the great conqueror which his deeds attest, had not his wit been in proportion to his strength and courage. We think he was far too shrewd a fellow to be outwitted or bullied by an earthquake. And therefore, if he made this his plea for raising the siege of *Aornos*, it was, in all probability, because his supplies had been cut off, (an easy matter in the *Mahabunn*), and he was ashamed to own his improvidence. *Alexander*, (see *Arrian*), did not attempt the siege until he had appointed *Krateros* to collect corn for the army into the town *Embolima*.

Of the name *Aornos*, I do not think it certain, as does *Mr. Loewenthal*, that it is Sanscrit. It was the second rock of that name and description which *Alexander* had taken: the first being in *Bactria* beyond the *Hindoo Koosh* and out of reach of the Sanscrit tongue. Its meaning in Greek is "unwinged" as if challeng-

[\*The map there given will be found useful for the present article.—Ed.]

ing all unwinged things. If, however, it be not Greek, it is not necessarily Sanscrit, for we have undoubted proof that the Pushtoo language was in use at that time in that region, and that the Afghan race held the region to which Aornos appertains. It might therefore be either a Pushtoo, or a Sanscrit, or an Aboriginal, or a Persian word.

There are several Hindi names of Forts which would have been rendered by the Greeks Aornos,—Urniya or the unapproachable, Woorna, Awur, Aonj or Wunj. The first of these, (now called Kotta,) stands at Umb Balimah (Embolimah,) and so overhangs the Indus on its eastern face, that water is ordinarily drawn up from the Indus by the garrison. But this rock, like Hodi's hill, is too contemptible to be the Aornos of history.

When first I approached the Indus at Torbaila, I felt that I was in presence of the veritable Aornos. And on discovering that the mountain rising like a green wall to the height of 3000 feet above the water, bore the name of Wunj or Aonj which the Greeks would have written Aornos, I deemed it almost certain that this particular rock was the stronghold in request. It was only when I learnt that Mount Aonj has no arable land and little water, so that although quite inaccessible against sudden invasion, it cannot hold out long; and that the Mahabunn, which has abundance of water, grass, firewood and arable land, is the ordinary refuge of the Eusufzyes of the plains with their families and cattle, that I was obliged to prefer the Mahabunn, a spur of which falls sheer into the Indus.

The Mahabunn itself, however, is invisible from the western brink of the Indus, being concealed behind Mount Aonj. The Greeks therefore might easily have confounded the two and have thought they were ascending the mountain pointed out to them as Aonj or Aornos.

From the junction of the Burrendor torrent (flowing out of Boonair) with the Indus, down to Atuk, the river margin has been most carefully searched, but although it seems improbable that Aornos should be below Atuk, this should not be left in doubt. The river's bank should be explored, as opportunity offers, down to Neeláb at least, bearing in mind that it is not a castle we must seek for, but a stupendous rock or mountain to which the people of the plains flee for refuge.

It is difficult to understand why Mr. Loewenthal supposes the author of the "*Gradus ad Aornon*" to have followed Curtius rather



than Arrian, in spite of the contrary assurance, given at the outset of that paper and carefully maintained throughout.

Although ourselves satisfied that the Mahabunn is the Aornos of history, we think the question quite open to discussion. We believe that the epithet of "rock" given to what Arrian's account clearly defines to have been an immense table mountain, has been the great difficulty hitherto in the search. Curtius' imagination immediately depicted it, as an obelisk of rock rising out of the Indus: and being more popular than Arrian, he has led many astray. But Arrian's account so distinctly lays down which part of the river to search for Aornos, viz., the neighbourhood of Umb Balimah, Bajra, Oora and Moosagurh, that the mountain in their neighbourhood forming the ordinary refuge of the Eusufzye, abounding in springs, grass, wood, and arable land, must needs be Aornos. And excepting the Mahabunn, which can turn out 12,000 matchlockmen, there is no such mountain on the right bank of the Indus.

Hitherto no British traveller has passed up the Indus higher than Umb, and to search higher for Aornos would be to no purpose, because no mountain higher up could have been the refuge of the Asupzye. But in cross-questioning native travellers, I discovered that there exists a white rock, (perhaps of milky quartz) on the right bank of the Indus, in the river basin, about fifty miles above Umb, called to this day "Tchitta Butt Kephale Bous." The first two words in the Punjaub dialect signifying "the white rock" and the two latter being manifestly Greek, signifying the "Bull's Head," which was also the name of Alexander's celebrated charger. So far as I can learn, there is no longer any carving on the rock; but it seems not improbable that there may have been a basso-relievo of Boukephalon in former days. The bigotry of the Muhummadans causes them to deface all sculptured figures of men or animals. It is the only instance I have discovered of a Greek name in a country abounding in coins bearing Greek Inscriptions. I mention this not as connected with Aornos but in order that it may be borne in mind by persons making enquiries in that corner of the Punjaub. During the eight years I was employed in Huzara, I was too much overworked to take even one week's leave of absence for the purpose of exploring.

*Remarks on the Taxila Inscription—By Professor J. DOWSON,  
Sandhurst College.*

[The following is a letter addressed to E. Thomas, Esq., the Society's Honorary Agent in London, and by him communicated to the Society.]

*Sandhurst, 15th September, 1863.*

MY DEAR SIR,—I am much indebted to you for so promptly sending to me General Cunningham's paper on the Taxila Inscription, and I very willingly adopt your suggestion of sending the few remarks I have to make upon it for insertion in the Journal of the Asiatic Society of Bengal. The discussion upon it will thus be greatly facilitated and more speedily brought to a conclusion.

The call which you sent to India, before my translation was published, for a separate independent version of this important record, was at once responded to by General Cunningham. Both translations are now before the world, and although there are many points of difference between them, there is quite sufficient of agreement, to satisfy even the most sceptical, that we are working upon a sure foundation. I perceive that General Cunningham has discovered the two slightly varying forms of the prefixed *r*, he has also made out the diverging form of the letter *y* as it appears in the Wardak Urn Inscription, with a rounded instead of the usual pointed head. We have thus simultaneously arrived at these decipherments, and I am happy to have my name associated with his as their godfather. Other identifications which I proposed will I hope recommend themselves to his approval, such as the *tt*, the compounds *han*, *mam*, *yan*, *s'wa*, &c.

Your announcement of my discovery of the true values of the Bactrian numerals has at once been adopted, and General Cunningham has gone through the various Bactrian dates, with results entirely in accordance with my own. In one instance, that of the Ohind Inscription, he has amended the old reading of the date, by changing the unintelligible word *vaomiti* into *attamili*. I proposed this emendation, but having only the lithograph before me, I did not venture upon making it. He has doubtless consulted the original document or independent copies. We thus get another confirmation of the value of the two crosses forming the number 8.

I have gone most attentively through General Cunningham's transliteration, and after duly considering all the points of difference between

his reading and my own, I in every instance prefer my own transliteration. In his laudable desire to prepare an entirely independent version, he was necessarily hurried, and was unable to bestow upon the Inscription the same amount of attention and study as it received from me. I am sanguine therefore as to the probability of his acquiescing in most if not in all of my readings, and that eventually our differences both of transliteration and interpretation will be reduced to a minimum.

It is not my intention to minutely compare our readings, or to comment upon all the differences. Any passages in my version which may be impugned, I shall be ready to defend, or frankly surrender when the time comes; but there are a few points of difference which are of some importance, and deserve notice, one especially in which General Cunningham's version enables me to improve my own translation.

First as to the transliteration. The compound character which I have rendered *tt*, General Cunningham has made to be *th* in the date and in the Ohind date. The same character really appears again in the third line, in the word which I have read *apraṭṭitavita*, but the copy published in this Journal is defective in this instance, having *v* instead of *tt*. This blemish in the copy renders necessary a revision of General Cunningham's reading, and I doubt not that he will accept my version. General Cunningham corrects the word *prachu* (east) into *pa-cham* (west), because Hussun Abdal, the place where the plate was found, is N. W. not N. E. of Taxila. I cannot, however, assent to this alteration. The letters of this word are as perfect and distinct as any in the whole Inscription, and they form most unequivocally the word *prachu*. This may be a blunder, but it is just as possible that it may admit of explanation. The plate was "found" at Hussun Abdal but we are not sufficiently acquainted with the facts of its discovery, to justify us in a positive assumption of its having been originally deposited there. However this may be, it is surely better to transcribe the word as it stands, and if it be an error, to prove it so. The one course decides the matter, whether rightly or wrongly; the other leaves it open to discussion and to the light of future discoveries. The next point of difference which requires notice, is the words which I read "*sangharamam cha*," but in which General Cunningham finds "*Sangha Rachite (na)*" and understands them as forming the name of the person who deposited the relic. We agree in the word "*Sangha*"

but I unhesitatingly reject the reading "*Rachite (na)*". The first letter is certainly *r*, but it is completely curled round at the point in a way that I have supposed to represent the vowel *i* in the word *Ohhatrapasi*. There is this difference, however, between the two words; both occur twice, but while the curled point is distinctly repeated in the *s* it is not so in the *r*. In the short line at the foot, the word is clearly written "*sangharama*." This leads me to believe that the curl of the *r* in this passage is simply an exaggeration. The next character is "*man*." General Cunningham has failed to recognize the *anuswara* here, like as he has failed to observe it as subjoined to the *h* in the word *mahantasa*. For these reasons I hold to the reading "*sangharam cha*," taking the final syllable of the first word to represent a Gen. pl. I may also add, that it seems clear to my mind, that Liako Kusuluko himself, and no other person, performed the deed which the Inscription commemorates. There are other minor points of difference in the transliteration which may be passed over at present, I will only remark that the final letters of the body of the Inscription which General Cunningham has passed over as illegible, and which I have read as *wajae*, are perhaps better brought out in the copy sent to India than in the lithograph published at home. They are at best only doubtful, and my reading can only be looked upon as plausible.

Babu Rajendra Lal has already suggested some emendations of General Cunningham's translation which bring it more into conformity with my own. Thus, he proposes *pújá*, instead of *puñya*, as the equivalent of *puyaye*; and he is disposed to reject the idea of *ayu-balavardhia*\* being a name. With the analogies of *raya* for *rájá* and *Kuyula* for *Kujula* it is needless to argue in favour of *pújá* being the right word. It may, however, be observed that *puñña* not *puya* is the Prakrit and Pali form of *puñya*. This emendation will require that the rendering of *sarva-buddhána* should be changed from "all Buddhists" into "all the Buddhas" as I translated it, and which seems in every way preferable.

I will now proceed to notice that portion of General Cunningham's rendering which I consider more accurate than my own. It is the beginning of the Inscription, where he refers the phrase "*etaye*

\* The final of this word is clearly *a* not *ka*. The lithograph of this Journal is inferior to the home one in this spot.

*purvaye*" to the date, and not, as I did, to the general context. This leaves the words "*Chhahara* and *Chukhsa*" free to represent the names of those districts of which Liako Kusuluko was Satrap. In the first instance I was inclined to look upon this phrase as the equivalent of the Sans. *etat-pūrve* "before this," and could this rendering have been made consistent with grammar, it might have been worked in; for the Inscription speaks of the erection of the building in the past, and the deposit of the relic in the present. I had no knowledge of the same or similar phrases having been met with in other Inscriptions, and not seeing how to connect the words with the date, I very dubiously rendered them as signifying "in the presence." General Cunningham says he has found the same words in an Inscription which he has lately discovered at Sravasti,\* and that a similar phrase occurs in the Mathura Inscription. These, however, remain unpublished, and the only other records in which the phrase is used, are the Grants of King Hastin and the Inscriptions of Erikaina, which were published in this Journal in 1861 by Professor Fitz-Edward Hall, and which unfortunately had not come under my notice when I made my translation. The interpretation which Professor Hall put forth, in his very careful reproduction and translation of these Inscriptions, has been adopted by General Cunningham, and he accordingly translates the expression *etaye purvaye* as "on this aforesaid date." The true meaning of *pūrva* is "first, prior," and if two dates were given it would refer to the first of them. The word might possibly have the sense of *pūrvokta*, "aforesaid," but I cannot admit this to be its meaning in the Inscription before us. It is not credible that a document of such remarkable conciseness and brevity, should, immediately after the date and without the intervention of a single word, employ the needless tautology "on this aforesaid date." The same observation is applicable to the equivalent phrase in Professor Hall's Inscriptions. In every instance it is used in immediate connection with the date—never in the middle or towards the end of the record, where such a form of words as "on the aforesaid date" might be required to obviate ambiguity. A careful consideration of all the passages in which the

\* He also reads it immediately after the date in the Manikyala Inscription. The word *pūrva* is most probably there, as I have pointed out; but we are hardly justified in reading "*etaye purvaye*." The first and last letters are distinct in my tracings—they are certainly different from the *e* of which we have an example at the end of the first line.

expression occurs fully confirms the justice of this general criticism, and convinces me that the true signification has yet to be discovered.

The following are the passages in which the words are found :—

Grants of King Hastin—No. 1. षट्पञ्चाशत्तरेऽब्दशते गुप्तपराज्यभुक्तौ महाविशाखसांवत्सरे कार्तिकमासे शुक्लपक्षतृतीयायामस्यां दिवसपूर्वायां ।

2. त्रिषष्ट्यन्तरेऽब्दशते गुप्तपराज्यभुक्ते महाश्वशुजासांवत्सरे चैवमासं शुक्लपक्षद्वितीयायामस्यां दिवसपूर्वायां ।

Erikaina Inscriptions—No. 1. शते पञ्चषष्ट्यधिके वर्षाणां भूपतौ च बुधगुप्ते अषाढमासशुक्लद्वादश्यां सुरगुरोर्दिवसे संसुरम् कालिन्दीनर्मदयोर्मिधां पालयति लोकपालगुणैर्जगति महाब्रह्मियमनुभवति सुरश्लिचन्द्रे च अस्यां संवत्सरमास-दिवसपूर्वायां ।

2. वर्षे प्रथमे श्रृष्वीं श्रृष्वकीर्तौ श्रृष्वद्युतौ महाराजाधिराजश्रीतोत्तरेमासे प्रभासति फाल्गुनदिवसे दशमे इत्येवं राज्यवर्षमासदिनेः एतस्यां पूर्वयामे खलक्षणेवत्त-पूर्वायां ।

The phrase *divasa-purvayām* in the first of these was translated by the late Professor Wilson, “in the forepart of the day.” Professor Hall in the first instance adopted this interpretation, though objecting to the original phrase “as illegitimate Sanskrit in this sense.” Subsequently he altered it, saying “a re-perusal of the Eran Inscriptions has taught me to unlock this quaint and antiquated expression. Understanding *tithyām* I would construe, not over literally, ‘on that i. e. the *aforesaid* lunar day, and on the day of the week therewith coincident.’” In the second Erikaina Inscription, the phrase apparently differs, being, as above quoted, *pūrvayāme*. This however is a supposititious restoration of Professor Hall’s, who says, in respect of the final syllable, “here there is an erasure where I propose *me* until ingenuity shall improve upon it.” This phrase he translates “during the first watch of the said lunar day ;” but this is inadmissible. *Eta-syām* is a locative and cannot be thus construed as a genitive. The phrase is the manifest parallel of the “*asyām pūrvayām*” of the other Inscriptions. The inserted final *e* should therefore be struck out, and with it the meaning of “watch of the day.” Professor Hall’s idea of the word *tithyām* being understood is very ingenious, but it will not, I think, bear the test of a rigid scrutiny. In the first two of the passages above quoted the expression is “*divasa-pūrvayām*,” in the third it runs “*samvatsara-māsa-divasa-pūrvayām*.” These are both compounds, agreeing grammatically with the word expressing the date of the month, in which numeral the word *tithyām* is undoubtedly

implied. There is nothing therefore to prevent their being taken together if they can be reasonably connected. If however these phrases apply with the date of the month, to the word *tithyám* understood, it can only be as *Bahuvrīhi* or descriptive compounds; and it is difficult to see how the words "day," and "year, month and day," can in any way make a descriptive epithet of a *tithi* or "lunar day." Professor Hall's rendering "on that i. e. the aforesaid lunar day and on the day of the week therewith coincident" is an amplification which I cannot extract from "*divasa-pūrváyám*;" nor can I see my way to his rendering of the longer compound "on that *lunar day* specified with the year, month, and *week day* aforesaid." The last of the above quoted passages gives, at first sight, some support to Professor Hall's theory. Having amended the reading, as above proposed, we have *etasyám pūrváyám* which might fairly be taken as applying to *tithyám* if we could conceive such an expression as "aforesaid" to be required or appropriate. Unfortunately however for the theory, the date does not refer to a *tithi* or lunar day, being expressed in the masculine, "*Phālguna-divase das'ame*," with which, it is obvious the feminine "*etasyám pūrváyám*" can have no grammatical agreement. This seems conclusive proof that the expression cannot signify "aforesaid," there being nothing aforesaid with which it agrees.

Again, in our Taxila Inscription, the phrase "*etaye purvaye*," the exact equivalent of "*etasyám pūrváyám*," is used after a date which General Cunningham and I have independently concurred in reading as Panæmus, and it is obvious, that the technical *tithi* of Hindu Chronology can have no application to a Macedonian date.

I have entered thus at length into the reasons which induce me to dissent from the proposed interpretation, because I am anxious to arrive at the true solution of the phrase; and because the respect due to the learning of Professor Hall demanded a full statement of the grounds for my dissent from his rendering. What then is the signification of the phrase? The Dictionaries afford no satisfactory information. As an adjective the word *pūrva* means "first, prior;" as a feminine noun *pūrvá*, it signifies "the East." These significations are clearly inapplicable. We must therefore, if possible, deduce a meaning, consistent with the primitive sense of the word and the context of the passages in which it occurs. After careful consideration of the different sentences I am of opinion that the word is

always used as a noun (feminine), by so taking it, all difficulties of construction are avoided. Keeping in view the primary signification of the adjective, and the repeated use of this word in connection with dates, it may be conjecturally rendered as *first* or *remarkable occasion*. The day to which the phrase is applied may have been made famous by the deed which the Inscription commemorates, but, it may also have been notable for events of which we are necessarily ignorant, such as the birth or accession of the king. The second Erikaina Inscription affords perhaps some slight corroboration of this theory, as it records the building of a temple in the *first* year of the king's reign, possibly the *first* temple he had erected. The same Inscription supplies some little further support in the curious phrases immediately preceding and following the words "*etasyām pūrvāyām*." Professor Hall transcribes the first passage as above, "*rājya-varsha-māsa-dinaih*," but in Prinsep's Lithograph (Journal Vol. VII. p. 632) the last word is clearly *dineh*. He, however, coincides with Professor Hall in transcribing it *dinaih*, i. e. an instrumental plural. This case, however, comes in very awkwardly as is shewn by the translation "*in the year, month, and day of his reign*." The Lexicons afford no countenance to a crude form "*dini*" for "*day*," but if such a form exists, "*dineh*" will be the Genitive singular and the context will read "*On this notable occasion of day, month and year in the king's reign (or, of the kingdom)*." After this passage, come the words "*swalakṣaṇairuktapūrvāyām*"\* which Hall renders "*as circumstantiated*," but which may signify in accordance with the view now taken "*an occasion remarkable for its peculiar incidents*." I propose these interpretations as conjectures only, and will readily give them up if better solutions are produced. The phrase "*etasyām pūrvāyām*" is undoubtedly full of obscurity, and if I have failed in throwing a true light upon it, I must console myself with the recollection that the deep learning of a Wilson failed to elicit its meaning.

To return now to our Taxila Inscription. I propose to amend my translation as follows: "*In the year seventy-eight (78) of the great king the great Moga, on the fifth (5) day of the month Pauanus. On this notable occasion, the Satrap of Chhabara and Chukhsa, by name Liako Kusuluko deposits a relic of the Holy S'ākya-muni in the s'epatiko (which he had) established in the country called Chhema,*

\* The letters *ru* are confessedly very indistinct and open to improvement.



north-east of the city of Taxila, in honour of the great collective body of worshippers and of all the Buddhas; for the honouring of his father and mother; for the long life, strength and prosperity of the Satrap's son and wife; for the honouring of all his brothers and relatives; and for making known his great liberality, fame and success."

General Cunningham proposes to identify Chhahara and Chukhsa with Hazára and Chach, or "Chach-Hazára" as the twin districts are now designated. The locality is suitable and there is some similarity in the sound of the words, but the identity cannot be considered more than presumptive. A clearer and more valuable identification is proposed in his supposition of the *Moga* of the Taxila Inscription being the same as the *Moa* or *Maua* of the Coins. To support this identification he cites the name of *Gondophares*, which appears on some of the coins as "*Undopherras*." In my former paper I have given reasons for considering the *Yarugasa* and *Yaiüasa* of the coins to be varying forms of the same word, like *dhamikasa* and *dhamiasa*. To this I will now add, in illustration of the way in which the guttural letters are elided, the name by which the Prakrit designates itself, i. e. *Páudam* = *Prakritam*. So far as mere orthography goes, the names may be considered identical. The number and variety of the coins of *Moa* prove him to have been a monarch of considerable power and importance, one from whom an era might well take its rise. For these and the other reasons which General Cunningham has advanced, I am disposed to consider the identification of *Moga* with *Moa* to be all but proved.

General Cunningham's rendering of the Peshawar Vase Inscription as amended in his Postscript at page 172 is identical with my own, save and except the first letter, which is given as *S* instead of *G*. This is a manifest error of the copyist or printer. We get the letter *m* of *ayam* somewhat differently. He perceives a dot after the *y* which he takes to be the *m*; I, however, find the nasal in the curve of the right limb of the *y*. A few passages of the Wardak Vase Inscription have also come under the notice of General Cunningham and he proposes to amend Rajendra Lal's reading "*asansthanana*" in the last line by substituting "*acharyanam*." Not satisfied with the Babu's reading, I somewhat hesitatingly changed it in my version to "*asans'rana*" a word of much the same meaning. Rajendra Lal admitting the General's rendering to be more appropriate, demurs to the accuracy of

the transliteration. I am quite prepared to read the third character as *ry* instead of *s'r*, for as I formerly stated the *r* certainly comes first, and the *s'* is not distinguishable from *y*. The difficulty is in the second character, which is badly formed and somewhat dubious, but I cannot bring myself to recognize in it the letter *ch*. The General says he finds the same word, "*acharyanam*," in the unpublished Sravasti Inscription or I should hesitate in admitting the word to have been so used among the Buddhists.

While on the subject of Inscriptions I take the opportunity of suggesting an emendation of Professor Hall's translation of two important passages in the grants of King Hastin, which will be found in the lines I have above quoted. My observations apply to the words *bhuktau* and *bhukte*. The simple idea conveyed by these words is that of *eating* or *enjoyment*, but out of these the Professor has elaborated the sense of "waste" or "destruction" in order to bring them into conformity with the word "*s'ánte*" which is elsewhere similarly used and which he has translated "being extinct."\* He has certainly got an approximation to the sense, though, to adopt his own words upon Professor Wilson's rendering of another passage, he has not, verbally considered, unriddled them aright. The first passage is "*Gupta-nripa-rájya-bhuktau*," which he renders " (In the year 156) of the extinction of the sovereignty of the Gupta Kings." Wilson's version was "of the occupation of the kingdom by the Gupta Kings" (Prinsep I. 251-2). This was certainly objectionable, but simply change the word *by* into *of* and all becomes clear. The word *bhuktau* may be taken in its well ascertained sense, and no development or stretching of the signification is required. The true reading of the sentence, as I take it, is "In the year 156 of (my dynasty's) possession of the realm of the Guptas." The second Inscription reads "*Trishatyuttare 'bdas'ate Gupta-nripa-rájya-bhukte*," the noun *bhukti* being changed for the participle *bhukte*, which is made to agree with the date. Professor Hall renders it "163 years after the domination of the Guptas had been laid to rest." According to my view, it should read "In the 163rd year that the realm of the Guptas has been possessed (by my dynasty). It may be considered perhaps that the words *s'ánte* and *bhukte*, having been similarly used, must therefore have a similar signification. To meet this view

\* See Kahaun Inscription, Journal for 1861, page 3.

it may be observed, that the words may be brought into pretty close agreement without any violation of the true meaning. *S'ánta* signifies "quieted, humbled." The words "*rájye Skandha-guptasya s'ánte varshe trins'ad-dasaikottaraka-s'atane*" may therefore be rendered "In the year 141 since the kingdom of Skandha Gupta was humbled (by us)" which is much the same as saying that it was taken possession of and occupied. The origin of this difference of translation is palpable. Professor Hall considered the matter from a Gupta point of view, I have looked upon it through the medium of the authors of the Inscriptions, who probably thought more of magnifying themselves than of recording the downfall of a by-gone dynasty.

PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,  
FOR AUGUST, 1863.

A. Grote, Esq., in the chair.

The proceedings of the last meeting were read and confirmed.

Presentations were received—

1. From Lieut.-Col. R. C. Tytler, a collection comprising specimens of bats, birds, reptiles, and fishes from Port Blair; also some skulls of turtles and two skulls said to be skulls of natives of the Andamans; one of these, coloured with ochre, was found in a native camp and is supposed to be the skull of a chief.

2. From the same, a large black basket prepared by the natives of the Nicobars, and a light-coloured basket made by the aborigines of the Andamans, and used by them as a fishing bag.

3. From His Honor the Lieutenant-Governor of Bengal, a dead Gayal.

4. From A. Galloway, Esq., a stuffed specimen of a crocodile killed by himself.

5. From the Assistant Secretary, Government of India, Foreign Department, two copies of a series of fifty-four photographs, illustrative of the tribes of Central India, taken by Lieut. J. Waterhouse, of the Royal Artillery.

The Chairman stated that Lieutenant Waterhouse had kindly mounted a set of this series and other photographs in their collection in the Society's portfolio.

The thanks of the meeting were voted to Lieutenant Waterhouse.

A communication from Sir Mordaunt Wells intimating his desire to withdraw from the Society was recorded.

The following gentlemen, duly proposed at the last meeting, were balloted for and elected ordinary members :—

Coomar Chundernath Roy and Baboo Bunkim Chunder Chatterjee, B. A.

The following gentlemen were named for ballot as ordinary members of the next meeting :—

Captain F. Norman, Quarter-Master General's Department, proposed by Colonel Strachey and seconded by Mr. Atkinson.

Baboo Shama Churn Sirkar, proposed by Mr. Cowell and seconded by Mr. Bayley.

T. Bruce Lane, Esq., B. C. S., proposed by Captain Lees and seconded by Mr. Grote.

Duncan Stewart, Esq., proposed by Mr. H. F. Blanford and seconded by Mr. Heeley.

The Chairman read to the meeting the following letter from Mr. Cowell resigning the office of Joint Secretary :—

“ A. Grote, Esq., Vice-President, Asiatic Society.

“ Dear Sir,—I beg to tender my resignation of the Secretaryship of the Asiatic Society, as my health, as well as my professorial engagements, entirely preclude my undertaking any longer to hold it.

“ It will be remembered that this is no new idea. I have several times wished to resign, and I now feel an absolute necessity to do so. I am merely sacrificing my health and time uselessly to the Society as well as myself, as my editorial work for the *Bibliotheca Indica* is at a stand-still, from the incessant interruption which the editing of our Journal causes. I believe that more credit would redound to the Society as well as myself from vigorously continuing the *Taittiriya Sanhitā*. There are many in Europe who are anxious to see this, but the edition must continue at a stand-still so long as the little leisure I can command has to be given to correcting proofs for the Journal.

“ I may remind the Council that I reluctantly accepted the office at the very first, as I knew how difficult it would be to find time for it ; and I have already held it five years and a half, so that I think I may now fairly claim my discharge. I need hardly add that it is from no diminution in my attachment to the Society ; had I more time, I should have been proud to retain the Secretaryship as long as the Society wished.

“ I remain &c.,

“ (Sd.) E. B. COWELL.

“ Calcutta, 30th July, 1863.”

The Chairman observed that he read this letter with very great regret in which he felt sure that the meeting and the Society generally would join. The only set-off against the loss of Mr. Cowell's services as Secretary was the hope held out of greater progress in the publication of the *Black Yajur Veda* in the *Bibliotheca Indica*.

He would move the following resolution, which he thought would have the meeting's countenance :—

That this meeting desires to record its sense of the services rendered by Mr. Cowell as Secretary during an incumbency of five and a half years, and to express its regret at his inability to remain in that office.

The resolution having been put to the vote, was carried unanimously.

Communications were received—

1. From Lieut.-Col. R. C. Tytler, a short description of a new species of *Paradoxurus*.

2. From C. Campbell, Esq. Executive Engineer, Delhi Division, a copy of a memorandum lately submitted to the Punjab Government on the life-sized statues of elephants exhumed in the Delhi palace.

3. From Baboo Gopeenath Sen, Abstracts of the Hourly Meteorological Observations taken at the Surveyor General's Office in May last.

4. From Colonel Tickell, an account of the Gibbon (*Hylobates lar*), with remarks on its range and habits.

Mr. Blanford read the paper of Colonel Tickell, and made some comments on the subject of it, which were subsequently confirmed by the Chairman.

Thanks were then accorded to the author and to Mr. Blanford.

#### FOR SEPTEMBER, 1863.

The Monthly General Meeting of the Asiatic Society of Bengal was held on the 2nd instant.

E. C. Bayley, Esq., President, in the chair.

The proceedings of the last meeting were read and confirmed.

Presentations were received—

1. From Colonel Phayre, on the part of Dr. C. Williams, an inscribed tile with Buddhist figure found at Tagoung, similar to those presented by the Colonel in May last.

2. From the Anthropological Society of London, a copy of No. 1 of the *Anthropological Review*, containing the proceedings of the Society.

3. From H. L. Haughton, Esq., five specimens of sea snakes from Hidgelli, viz., *Hydrus Schistosus*, *Hydrus Obscurus*, *Hydrophis Gracilis*, and two species not determined.

4. From Baboo Rajendra Mallika, a dead Emeu.

5. From the Imperial Government of Russia, a copy of the *Bibliorum Codex Sinaiticus*, in four folio volumes, published by the Imperial Government.

The following letter, which was read, accompanied the presentation :—

“ *Londres, le 11 Juillet, 1863.*

“ **MONSIEUR**,—Le Ministre de l' Instruction publique, d'ordre de sa Majesté l'Empereur, m' a invité à offrir à la Société Asiatique du Bengale à Calcutta un exemplaire du *Codex Sinaiticus*, édité aux frais du Government Imperial par les soins du professeur Tichendorf.

“ Je fais un devoir empressé de vous transmettre cet ouvrage, en vous priant d'agréer l'assurance de ma considération très distinguée.

(Signed) “ **BRUNNOW.**

“ *Au Secrétaire de la Société Asiatique du Bengale à Calcutta.*”

On a motion made by the President, the thanks of the meeting were unanimously accorded to the Imperial Government of Russia.

A letter from Lieutenant-Colonel H. C. James, intimating his desire to withdraw from the Society, was recorded.

The following gentlemen, duly proposed at the last meeting, were balloted for and elected ordinary members :—

Captain F. Norman, Quarter-Master General's Department ; Baboo Shama Churn Sirkar ; T. Bruce Lane, Esq., B. C. S., and Duncan Stewart, Esq.

The following gentlemen were named for ballot, as ordinary members, at the next meeting :—

T. Martin, Esq., Principal, Civil Engineering College, proposed by Mr. Blanford and seconded by Mr. Atkinson.

Dr. J. Ewart, Professor of Physiology at the Medical College, proposed by Dr. Fayrer, and seconded by Mr. Blanford.

Dr. W. K. Waller, proposed by Mr. Blanford and seconded by Dr. Fayrer.

Moulvie Waheedoon Nubbee Khan Bahadoor, Deputy Magistrate of Sealdah, proposed by Moulvie Abdool Luteef Khan Bahadoor and seconded by the Secretary.

Major Dickens, proposed by Dr. Fayrer and seconded by Mr. Blanford.

The Council reported that they had received a letter from Colonel Thuillier resigning the office of President, and a letter from W. S. Atkinson, Esq., resigning the office of Secretary to the Society. The first mentioned letter they had received in April, but they had deferred acting upon it until the present time, in the hope that after a few months' absence Colonel Thuillier might be enabled to resume his seat as President of the Society, but having lately received an assurance that he had no expectation of returning to Calcutta for several months, they had, in accordance with the provisions of Rule 57, elected Mr. E. C. Bayley to the office of President for the remainder of the current year. This election would be subject to confirmation by the Society at the next meeting.

The Chairman read the letter.

*Calcutta, 15th April, 1863.*

"SIR,—I regret very much that circumstances compel me to leave Calcutta to proceed to the Upper Provinces on duty, and how long I may be absent is quite uncertain. I much fear I shall not be back before the end of the year, if then.

"My health is also so much broken that it is absolutely necessary to have some respite from work, I therefore beg to request the favour of your laying my resignation of the President's chair, to which I was elected at the last annual meeting, before the Council of the Society.

"In giving up this honour, I need hardly say with how much regret I do it. I have tried hard to avoid the alternative of leaving Calcutta, and have put it off to this late date, solely on account of my position in the Society.

I have, &c.

(Signed) "H. L. THUILLIER, *Lt.-Colonel.*

"W. S. ATKINSON, Esq.,

*Secy. Asiatic Society of Bengal."*

The Chairman then read Mr. Atkinson's letter resigning the office of Secretary to the Society :—



“ *August 14th.*

“ MY DEAR GROTE,—I expect to leave Calcutta within a fortnight and to be absent probably for several months, I shall be much obliged if you will at once lay before the Council my resignation of the office of Secretary.

“ You and our colleagues are aware that I have long intended to take this step on the first occasion when my absence from Calcutta became necessary, and it will be convenient for all parties that I should give up the Secretaryship now, so that I may make over charge of the office to my successor before I leave.

“ I must ask you to convey to the Council and the Society my warm thanks for the confidence they have so long reposed on me, and assure them that, though no longer in office, I shall not cease to take the same hearty interest as heretofore in all that concerns the Society's welfare.

“ Very sincerely yours,

(Signed) “ W. S. ATKINSON.

“ A. GROTE, Esq., *Vice-President, Asiatic Society.*”

The Chairman then stated that in accordance with the provision of the same Rule, the Council had appointed Mr. H. F. Blanford as Secretary to the Society, which appointment would likewise be submitted to the Society for confirmation at the following meeting. He then proposed and Mr. Grote seconded the following resolutions expressive of the Society's acknowledgment of the eminent services rendered to it by Col. Thuillier and by Mr. Atkinson :—

That the thanks of the Society be given to Col. Thuillier for his conduct of the Society.

This being put to the vote was carried unanimously.

The Chairman proposed that the warm thanks of the Society be given to Mr. Atkinson for his services as Secretary during the long period of more than seven and a half years.

This proposition being put to the vote was carried unanimously.

The chairman further announced that the Council had elected Lieutenant-Colonel J. E. Gastrell and Dr. S. B. Partridge, as members of their body, in the place of Colonel Thuillier and the Hon'ble H. S. Maine, and that Captain W. N. Lees, LL. D., had been appointed a Vice-President of the Society in the place of Mr. E. C. Bayley.

The Council further reported that they had granted to Mr. Blyth a

further leave of nine months on full pay, contingent on the application for pension not being complied with by the Secretary of State for India before the expiration of his present leave.

Communications were received—

1. From the Under-Secretary to the Government of India, Foreign Department ; Lieutenant-Colonel Pelly's report of his tour round the northern portion of the Persian Gulf, with journal of the route and a sketch map by Dr. Colvill.

2. From Lieutenant-Colonel J. Abbot ; remarks on the site of Aornos.

3. From Lieutenant-Colonel S. R. Tickell ; Memo. relative to three Andamanese in the charge of Lieutenant-Colonel S. R. Tickell, when Deputy Commissioner of Amherst, Tenasserim, in 1861.

The Secretary having read this paper, the thanks of the meeting were voted to the author for his interesting remarks.

4. From Baboo Gopinauth Sen ; Abstracts of the Hourly Meteorological observations taken at the Surveyer General's Office in June last.

5. From Major-General Cunningham ; note on a Bactro-Pali inscription from Taxila.

6. From the same ; remarks on the date of the Pehewa Inscription of Raja Bhoja.

The Chairman read the papers from General Cunningham.

Babu Rajendralala Mitra, adverting to General Cunningham's comments on his paper on the Bhoja Raja of Dhar and his homonyms, stated that some of the errors dilated upon by the General had been already acknowledged or corrected by him, and that others were due to misapprehensions on the part of that gentleman, which could be easily explained ; but they required more time and attention than he could then devote to them, and that, even if he did, he would tire the patience of the meeting by a number of quotations and references which could not be easily followed. There were others, again, he said, which were attributable to differences of opinion, and he did not wonder that they should exist. When it is remembered that scholars differ as to the correct readings of texts published only three or four centuries ago, and that the commentators of Shakespeare had not yet come to a determination as to the original reading of many passages in the writings of that prince of poets, it was but natural that those who had to deal

with smudgy inscriptions recorded on dilapidated stones, battered by the rains of centuries, written in characters now all but unknown, and in languages which had become obsolete, and the decyphering of which had to be effected by a series of guesses, should entertain opinions irreconcilable with each other. These, therefore, he did not wish then to dwell upon. He could not, however, allow that opportunity to pass without adverting to the three instances of "errors of omission" of which he stood charged. They were as injurious to him as they were unfounded, and he wished therefore to give them the earliest possible correction. The first instance, he observed, of which the General complained, was a discovery of his as to the identity of the Bhoja Raja of Gwalior with the great Bhoja of Malwa, noticed in the *Rājataranginī*, which, it was alleged, had been appropriated to himself by the Babu without acknowledgement. The General, in his letter published in the 29th volume of the Journal (p. 395,) says—"Of the Gwalior inscriptions one of the most interesting is a record of Bhoja Deva, dated in 933 Samvat, both in words and figures, A. D. 876. As this date agrees with that assigned to the great Bhoja of Malwa by Kalhan Pundit, viz., A. D. 883-901, there can be little hesitation in attributing this inscription to the *famous* Bhoja." The epithets "great" and "*famous*" used by the General (the latter in Italics,) coupled with the Bhoja of Malwa, leaves no doubt as to his having alluded to the hero of the *Bhoja probandha*, for to no other sovereign of Malwa could those epithets be correctly applied. To him, however, the Bábu had made no allusion. In this paper on the Bhojas, he had pointed out the identity of the Bhoja of Gwalior with one of the two Bhojas of Kanouj, of whom General Cunningham had made no mention whatever, and not with the king, of that name, of Malwa, who, he maintained, lived a century after the Prince of Gwalior, and could not, therefore, have been identical. The accusation of misappropriation in connection with the Bhojas was, therefore, entirely unfounded.

With regard to the second instance of error of omission it was remarkable, the Babu noticed, that in the same breath in which the General blamed him for adhering to the old reading of the Rohtas inscription, he accused him of having pirated his new reading. If he did one he could not do the other. The fact, however, was that he had done neither. He had to compare the history of the same line of kings

in two separate inscriptions, the Rohtas and the Narwar, and on finding one of the names to be written *Hungara* in one and *Dungara* in the other, he attributed the difference to an error in the reading of the first named document, as that of the second, he found, had the support of three independent inscriptions from Gwalior. His reading of the documents was perfectly independent of the researches of the General, and his identification the inevitable result of the proofs he had before him, and he could not therefore hold himself in any way indebted for them to his critic, who, to the best of his knowledge, had nowhere given the correct reading *Dungara*. General Cunningham, in his letter on the subject, alluded exclusively to the Rohtas record, and said "the name of the fourth prince has been mis-read, it should be *Dunggara* and not *Hungara*." There was nothing to show that when he said this he had read either the Narwar or the Gwalior records, for he made no allusion to them, and his new reading, or more strictly suggestive alteration, was wrong, as he spelt the name with two g's (*Dunggara*) and not with one g (*Dungara*;) he could not therefore fairly claim the credit of a deduction which was founded upon an examination of four, till then, undecyphered documents.

The last instance of alleged error of omission on his part, the Bábu said, referred to the reading of the name of *Huvishka* and his identification with the *Hushka* of the *Rājataranginī* which General Cunningham claimed as his own. The name, however, as read by the General and printed in his letter in the 29th Vol. of the Journal, pages 400 and 401, was *Hoveshka* in the Wardak and *Huveshka* in the Mathurá inscriptions. These readings were got at without decyphering either of those records, and consequently were, to all intents and purposes, quite as much guesses as the General's suggestive reading of *Harishchandra* of the same word, and all three being wrong, had no claim to any consideration.

The Bábu was the first to decypher and translate the Wardak record, and as his reading was different from that of General Cunningham, (*Huvishka* and not *Hoveshka*) he felt bound in justice to himself to deny the claim of the General. The correct reading, *Huvishka*, was first met with in the Mathurá inscription by the Bábu himself, and subsequently in the Wardak record which he read with Mr. Bayley's tentative Nāgarī transcript in hand, and he did not feel called upon to concede to the General what was strictly Mr. Bayley's and his

own. Had General Cunningham decyphered or commented upon the Wardak inscription, the Bábu admitted he would have been bound to allude to him had he borrowed from such comment or decyphrement, but he repudiated the necessity of quoting incorrect readings of single words given casually in miscellaneous letters, even if he had remembered them, (which in the present instance he did not) and that simply to show that he had come to a different opinion. The identity of *Huvishka* with *Hushka* had been traced by perfectly independent research, and was quite different from that of *Hoveshka* with *Oöerke* and *Hushka*, for it was one thing to say *Huvishka* was the same with *Hushka* and quite another to say *Hoveshka* was the same with *Oöerke*. Where quotation was necessary no quotation was wanting. In the very paragraph in which the identity of *Hushka* and *Huvishka* was mentioned, the Bábu had quoted from the General's paper in the *Numismatic Chronicle* for the date of *Hushka*, and he thought that was all that he was called upon to do. The General in his letter in the 29th Vol. of the Journal, lays great stress on the identity of *Hoveshka* with the *Höerke* or *Oöerke* of the coins, but the Bábu had nowhere named *Oöerke* in his paper on the Wardak record, or attempted to trace his identity. Mr. Bayley, in his published note on that paper, alluded to the "probable" identity of *Huvishka* with *Oöerke* but not of *Hoveshka* with *Oöerke*, and therefore did not name the General. It is possible that the identity supposed by the General might suggest the idea of the identity doubtfully pointed out by Mr. Bayley, but the Bábu hoped that nobody would deny that those who were deeply engaged in the study of Bactrian numismatics, of the history of Kashmir, and of Northwest India generally during the supremacy of the Indo-Scythians, should more readily remember the well-known and well-established identity of *Kanishka* with *Kanerke* and *Hushka* with *Oöerke* and be thereby led to the idea of *Huvishka* being the same with *Hushka*, than remember an isolated passage in a short miscellaneous letter; but even if the reverse of this position be insisted upon, it was not necessary, he contended, to point out the suggestive power of an idea which had been already published and become the property of the public for a long time by quotations of authority and parade of foot-notes. The omission of quotations in such a case, would not in any way amount to neglect of the amenities of literature. The charge, however, was not of benefiting by working out in a different direction the first idea of another, but

of positive misappropriation of calling the discovery of another as one's own, and as he had shewn that he had nowhere borrowed the General's reading of *Hoveshka*, he held that the charge brought against him was utterly groundless. There was no doubt some similitude between *Huvishka* and *Hoveshka*, and in attempts to read the same document by different individuals such similitude must always occur; but he urged that it would be unjust if he who read the document correctly should be deprived of credit because his predecessors had given an avowedly incorrect but somewhat similar reading of only one of its words. Should the General maintain so wrong a principle and say that the difference between *Hoveshka* and *Huvishka* was immaterial and the credit of reading the word should be his, it should be observed that the syllables which he read *Hovesh* had been before him read to be the same by Mr. Thomas, and the credit of first reading therefore must rest with the latter gentleman and not with him. He regretted much, the Bábu said, that he had to make these remarks, for he entertained the highest respect for the General as a distinguished and most successful antiquarian, who had done much to throw new light on the history of his native land; but he was sorry he could not sit down quietly under the imputation of having misappropriated the discoveries of another.

The President remarked that he was perhaps personally somewhat to blame in the matter, for as Bábu Rajendra Lal had owned to obtaining from himself the reading of *Huvishka* and as the identification of the king of the Wardak Inscription with the *Huvishka* of the Muttra Inscription and the *Hushka* of the Raja Tarangini and the *Oöerke* of the Indo-Scythian coin-series had been already published by Gen. Cunningham, he was bound to say that the source from which he had derived the reading of *Huvishka* was undoubtedly General Cunningham himself. The President's tentative reading and transliteration had been, however, made merely for self-guidance, and the papers were made over without remark to Bábu Rajendra Lal, as the President had no leisure to complete the enquiry.

The Bábu had therefore no notice of the real author of the discovery at the time he wrote his article in question, for which the oversight of the President was chiefly to blame.

But in truth the identification of the *Hushka* of the Raja Tarangini with the *Oöerke* of the coins had been made so long since by General

Cunningham, that the further reading of *Huvishka* and its identification with *Hushka* was a comparatively obvious step, and though the whole merit rests with General Cunningham the earlier discovery is certainly the most important.

#### FOR OCTOBER, 1863.

The Monthly General Meeting of the Society was held on the 7th instant.

E. C. Bayley, Esq., President, in the chair.

The proceedings of the last meeting were read and confirmed.

Presentations were received—

1. From the Natural History Society of Dublin, Part 2, of Vol. III. of the Proceedings of the Institution.

2. From Babu Gunesh Chunder Banerjea, a copy of his work entitled *Chitta Santoshini*.

3. From Lieutenant-Colonel E. T. Dalton, three skulls of Moon-dha and Aheer tribes of Chota-Nagpore.

4. From Mr. Grote, on the part of Lieutenant-Colonel R. C. Tytler, an Andamanese Mynah and a Crow.

5. From Mr. Blanford, the skull of a young Polar bear.

6. From the Assistant Secretary to Government of India, Foreign Department, two copies of a series of 17 photographs of tribes inhabiting Cachar and Assam, taken by Dr. Simpson.

7. From the American Philosophical Society, several volumes of the Transactions and Proceedings of the Society.

8. From Mr. H. F. Blanford, the following collection of fossils:—  
115 species of German miocene fossils.

104 „ English miscellaneous fossils.

47 „ Swiss cretaceous fossils, (chiefly cephalopoda.)

75 „ German oolitic fossils.

15 „ Indian.

34 „ Miscellaneous.

The following letter, which was read by the President, accompanied the presentation.

*“ Asiatic Society's Rooms, 2nd October, 1863. ”*

“ TO THE PRESIDENT OF THE ASIATIC SOCIETY.

“ DEAR SIR,—I have the pleasure of offering to the Society the collection of fossils of which the accompanying list is a summary.

Having devoted some months to the determination and arrangement of the Society's fossil collection, I have much satisfaction in being able to add to that collection a series, a considerable number of which being the authentic determinations of two of the first palæontologists of Europe, Dr. Dunker, and M. Pictet, will, I believe, afford useful objects of reference to those who work at palæontology.

"As a valuable and extensive collection of fossils arranged in stratigraphic or geological order has been already formed by Dr. Oldham, I have arranged the fossils of the Society in natural history order, so as to form an integral, as they are an essential, part of a zoological museum. That such a collection is absolutely essential to the working naturalist and palæontologist I can affirm, not only from my own limited experience, but also from that of my late teacher, Edward Forbes, and I believe of palæontologists in general.

"The arrangement is that adopted in the British Museum collection; that of the Geological Museum of Jermyn Street being followed in the Survey Museum of Hasting's Street, in accordance with the requirements of field geologists.

"It is with the view mainly of aiding in the formation of a zoologically arranged series of fossils that I have the pleasure of offering the present collection to the Society; and it is with a view, so far as in me lies, to ensure the perpetuation of such a collection when the Society's museum becomes the property of Government, that I request that, should such a collection not be retained in the new museum, the present collection be then presented to the Presidency College.

"To avoid misapprehension I would say that the retention in the new museum of a zoologically arranged series of fossils, of which the present and all future donations of mine shall form part, is the sole condition I attach to the gift.

"Whether such a collection pass into the geological or zoological section of the new museum, I consider to be matter of secondary importance.

"I trust meanwhile that the Society may receive such additions to its fossil collection from other members of the Society as may render it a worthy representation of fossil zoology.

"I remain, &c., &c.,

(Sd.) "H. F. BLANFORD."



The President then proposed a vote of thanks to the donor, which was unanimously accorded.

9. From Captain Stubbs, Horse Artillery, Meean Meer, a new type of a silver coin of Shere Shah.

The following gentlemen duly proposed at the last meeting, were balloted for and elected ordinary members :—T. Martin, Esq. ; Dr. J. Ewart ; Dr. W. K. Waller ; Major Dickens ; Moulvie Waheedoon Nubee Khan Bahadoor.

The following gentlemen were named for ballot as ordinary members at the next meeting :—

Dr. M'Clelland, proposed by Mr. Grote, and seconded by Mr. Blanford.

Mr. Duff, proposed by Mr. Blanford, and seconded by Dr. Fayrer.

Dr. F. Stoliczka, proposed by Mr. Mallet, and seconded by Mr. Blanford.

R. T. Martin, Esq., barrister-at-law, proposed by Mr. Blanford, and seconded by Mr. Grote.

Major J. G. Gowan, proposed by Mr. Grote, and seconded by Mr. Blanford.

Babu Modhoosoodun Dass of Dacca, proposed by Moulvie Abdool Luteef Khan Bahadoor, and seconded by Moulvie Syud Ahmed Khan Bahadoor.

H. D. Sandeman, Esq., proposed by Mr. Blanford, and seconded by Mr. Bayley.

Letters from Messrs. S. Wauchope, J. Sanders, and from Major Fitzgerald, intimating their desire to withdraw from the Society were recorded.

The appointment of E. C. Bayley, Esq., President, whose election by the council had been announced at the previous meeting of the Society, being put to the vote, the choice of the Council was confirmed without dissent.

The appointment of Mr. Blanford as Secretary was also put to the vote, and confirmed by the meeting.

The election of Lieut.-Col. J. E. Gastrell and Dr. S. B. Partridge as members of the Council in the place of Colonel Thuillier and the Hon'ble H. S. Maine, and that of Captain Lees as a Vice-President of the Society in the place of Mr. E. C. Bayley, were likewise confirmed.

The Council further reported that they had taken into considera-

tion the motion of Captain Lees, and resolved to recommend the dissolution of the Committee of Papers and an alteration in accordance therewith to be made in Rule 77—viz., that in place of the words “sub-committees of finance and papers,” the words “a sub-committee of finance” be substituted.

The proposal being put to the vote by show of hands, it appeared that five votes were in favour of the alteration, and four against it. The President therefore announced that the votes of non-resident members would be taken in accordance with the provisions of Rule 43, and that it would then be finally submitted to the Society at the ensuing annual general meeting.

The Council also submitted the following report of the Philological Committee for the approval of the Society.

*Philological Committee's Report.*

“Dr. Kern, of Benares, has offered to edit the Sanskrit astronomical work, the *Vṛihat Sanhitā* by Varāha Mihira. It will occupy about four fasciculi. The Philological Committee recommend to the Council that it should be accepted, as it will be a valuable continuation of the astronomical works already published in the *Bibliotheca Indica*. They hope that Dr. Kern will add an English translation, which will greatly increase the value of the work.”

The vote of the meeting being taken on the report, the recommendation of the Philological Committee was unanimously adopted.

The President announced that an aerolite which had lately fallen near Dacca had been presented to the Society by the Lieutenant-Governor of Bengal; and he proposed that the thanks of the meeting be voted to his Honor for this valuable donation. The aerolite, he added, was now on its way to the museum.

Communications were received—

1. From J. E. T. Aitchison, Esq., a paper “On the Vegetation of the Jhelum District,” with lithographed maps and plans to illustrate the paper.
2. From the Under-Secretary, Government of India, Public Works Department, copy of a letter from Mr. G. Manners, Officiating Executive Engineer, Barrackpore Division, containing a list of the principal architectural remains near Hooghly.
3. From Babu Gopinath Sen, abstract of the hourly meteorological observations taken at the Surveyor General's office in July last.

4. From Captain H. H. G. Austen, a letter containing an emendation of his article, before submitted, on the system employed in outlining the figures of deities and other religious drawings as practised in Ladakh, Zanskar, &c.

5. From the Under-Secretary, Government of India, Foreign Department, a report by Lieutenant-Colonel Pelly on the tribes, trade, and resources around the shore line of the Persian Gulf.

The Secretary having read extracts from Colonel Pelly's report, the thanks of the meeting were voted to the latter for his interesting remarks.

6. From Captain H. G. Rayerty, a paper on the languages of the Siah Posh Kafirs, with a short list of words, to which are added specimens of the Kohistani and other dialects spoken on the northern border of Afghanistan.

7. From T. Oldham, Esq., a note on the fossils in the Society's collection reputed to be from "Spiti."

The Librarian submitted the usual monthly report.

#### LIBRARY.

The following are the accessions to the Library since the meeting held in July last.

#### *Presented.*

Annals of Indian Administration, Parts 2 and 3 of Vol. VII.—BY THE BENGAL GOVERNMENT.

Annual Report of the Geological Survey of India for 1862-63.—BY THE SUPERINTENDENT, GEOLOGICAL SURVEY.

Annual Report of the Insane Asylums in Bengal for 1862.—BY THE BENGAL GOVERNMENT.

Annual Report with tabular statements on the condition and management of the Jails, N. W. Provinces, for 1862.—BY THE GOVERNMENT N. W. PROVINCES.

The Anthropological Review, No. 1.—BY THE ANTHROPOLOGICAL SOCIETY OF LONDON.

Bijdragen tot de Taal-Land-en Völkenskunde van Nederlandsch Indië, Stuk 5 and 6, Vierde Deel.—BY THE AMSTERDAM ACADEMY.

Calcutta Christian Observer for July, August and September.—BY THE EDITOR.

Chitta Santoshinf.—BY BABU GUNESH CHUNDER BANERJEE.

Bibbiorum Codex Sinaiticus Petropolitanus. Auspiciis Augustissimis Imperatoris Alexandri II. Vols. 1 to 4.—BY THE IMPERIAL GOVERNMENT OF RUSSIA.

Journal of the Statistical Society of London, Vol. XXVI. Part 2.—BY THE SOCIETY.

Journal of the American Oriental Society, Vol. VII. No. 2.—BY THE SOCIETY.

Journal of the Chemical Society of London, 2nd series, Vol. I. Nos. 4 to 6.—BY THE SOCIETY.

Journal of the Academy of Natural Sciences of Philadelphia, Vol. V. Part 3.—BY THE ACADEMY.

Journal of the Royal Asiatic Society of London, Vol. XX. Part 2.—BY THE SOCIETY.

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Zenker's *Dictionnaire Turc-Arabe-Persan*, Part 4.

LALGOPAL DUTT.

7th October, 1863.

*Report of the Curator, Zoological Department.*

(Continued from page 90.)

VII. From the Melbourne Institution. A collection of Mammals and birds, the skin of one reptile and that of a fish.\*

The Mammals are—

Of PLACENTALIA Fam. MURIDÆ,—

\*HAPALOTIS APICALIS, Gray, *P. Z. S.* 1851, p. 126. (2 specimens).

\*H. MITCHELLII; *Dipus Mitchellii* Ogilby, *Tr. L. Soc.* XVIII., 129. (2).

\*MUS—? Length 4 in., with tail about 3 in.; hind foot  $\frac{1\frac{5}{8}}$  in.: ear-conch small, posteriorly  $\frac{3}{8}$  in. Fur straight, rather long, of the ordinary rat-brown above, ashy beneath, and the feet somewhat albescent; tail clad with short hairs, blackish above, albescent below. (2).

\*MUS—? Like a diminutive HAPALOTIS, with the exception of the tail. Length  $3\frac{1}{4}$  or  $3\frac{1}{2}$  in., with tail  $2\frac{1}{2}$  in.; hind foot  $\frac{3}{4}$  in.; ear-conch ample,  $\frac{1}{8}$  in. long posteriorly. Colour light brown above, the tips of the hairs black upon the back; below pure white, abruptly separated from the hue of the upper parts; tail dark above, whitish below and tolerably well clad; feet white. (2).

Of MARSUPIALIA,—

\*PHASCOGALE CRASSICAUDA; *Podabrus crassicaudatus*, Gould, *P. Z. S.* 1844, p. 105; Mammals of Australia, pt. I. pl. 5; Waterhouse, *Mamm. I.*, 428. (2).

\*PERAMELES OBESULA; *Didelphys obesula*, Shaw; Waterhouse, *Mamm. I.*, 368. (2).

\*P. GUNNII, Gray; Waterhouse, *Mamm. I.*, 376.

\*BETTONGIA GRAII; *Hypsiprymnus Graii*, Gould, *P. Z. S.* 1840, p. 178; Waterhouse, *Mamm. I.*, 203. (2).

\*HYPSPRYMNUS RUFESCENS; *Bettongia rufescens*, Gray, *M. N. H. n. s.*, I. (1837), 584; *Hypsiprymnus melanotis*, Gould, *Monogr.* pt. 2; Waterhouse, *Mamm. I.*, 196.

\*MACROPUS FRÆNATUS, Gould, *P. Z. S.* 1840, p. 92; Gould, *Monogr.* pt. I. pl. 13. (2). Also skull.

\* Species new to the Society's museum are distinguished by having an asterisk prefixed.



*M. GIGANTEUS*; *Didelphys gigantea*, Schreber; Waterhouse, *Mamm. I.* 62. Adult male; and female sent as *M. ocydromus*, Gould, *Ann. Mag. N. H.*, X. (1842), p. 1,—considered by Mr. Waterhouse to be a variety of the former. We had previously but a small example of this species, with its skeleton.

The Birds are—

*LICMETIS NASICUS*; *Cacatua nasica*, Temminck: Gould's *B. Austr.* V. 5.

\**CACATUA LEADBEATERI*, Vigors: Gould's *B. Austr.* V. 2.

\**POLYTELIS MELANURA*; *Palæornis melanura*, Vigors: Gould's *B. Austr.* V. 16. (2).

*PLATYCERCUS FLAVEOLUS*, Gould's *B. Austr.* V. 25. (2).

*PL. BARNARDII*, Vigors and Horsfield: Gould's *B. Austr.* V. 21. (2).

\**PSEPHOTUS HÆMATOGASTER*, Gould's *B. Austr.* V. 33. (2).

\**PS. MULTICOLOR*; *Psittacus multicolor*, Temminck; Gould's *B. Austr.* V. 35. (2).

*PS. HÆMATONOTUS*, Gould's *B. Austr.* V. 36.

*EUPHEMA CHRYSOSTOMA*; *Psittacus chrysostomus*, Kuhl.: Gould's *B. Austr.* V. 37. (2).

*MEROPS ORNATUS*, Latham; Gould's *B. Austr.* II. 16. (2).

This would appear to be the only Australian Bee-eater. It is not, however, peculiar to Australia; for Mr. Wallace lately obtained it in Ternate (*P. Z. S.* 1860, p. 348). It is not generally known among ornithologists; that the *SCYTHROPS NOVÆ HOLLANDIÆ* has been procured in Celebes and Batchian—apparently the limit of its equatorial migration.

*CUCULUS INORNATUS*, Vigors and Horsfield: Gould's *B. Austr.* IV. 85. (2).

*C. CINERACEUS*, Vigors and Horsfield: Gould's *B. Austr.* IV. 86.

*CHRYSOCOCCYX LUCIDUS*; *Cuculus lucidus*, Gmelin; Gould's *B. Austr.* IV. 89.

*GRALLINA PICATA*; *Gracula picata*, Latham: Gould's *B. Austr.* II. 54. (2).

\**CHLAMYDERA MACULATA*, Gould's *B. Austr.* IV. 8. (2).

\**CINCLOSOMA CASTANOTUS*, Gould's *B. Austr.* IV. 5. (2).

*FALCUNCULUS GOULDII*, Cabanis; *F. frontatus*, (Latham), *apud* Gould's *B. Austr.* II. 79. (2).

OREOICA CRISTATA; *Turdus cristatus*, Lewin: Gould's *B. Austr.* II. 81. (2).

\*SPHENOSTOMA CRISTATUM, Gould's *B. Austr.* III. 17.

\*POMATORHINUS SUPERCILIOSUS, Vigors and Horsfield; Gould's *B. Austr.* IV. 22.

\*P. PILEATUS, nobis, *n. s.* Distinguished from the last by having a bright ferruginous-brown cap, bordered by the white *supercilia*, and conspicuous white tips to the wing-coverts and tertiaries: the feet also are more robust. Sent as male of the preceding race; the sexes of which (according to Mr. Gould) are quite similar in plumage.

\*CLIMACTERIS ERYTHROPS, Gould, *var.?* (CL. AFFINIS, nobis, *n. s.?*). Like CL. ERYTHROPS, but with slight pale non-rufous *supercilia*, which are not conspicuously noticeable: throat dull whitish, passing to greyish on breast, and a small central ferruginous spot at base of throat: ear-coverts pale, streaked. Specimen doubtless of the female sex.

\*SITTELLA PILEATA, Gould's *B. Austr.* IV. 104.

COLLURICINCLA HARMONICA; *Turdus harmonicus*, Latham: Gould's *B. Austr.* II. 74. (3).\*

\*PACHYCEPHALA GILBERTII, Gould's *B. Austr.* II. 71.

P. RUFIVENTRIS; *Sylvia rufiventris*, Latham: *P. pectoralis* apud Gould's *B. Austr.* II. 67. (2).

PETROICA BICOLOR, Swainson: Gould's *B. Austr.* III. 7. (2).

\*P. GOODENOVII *Muscicapa Goodenovii*, Vigors and Horsfield: Gould's *B. Austr.* III. 5.

\*MALURUS MELANOTUS, Gould's *B. Austr.* III. 21. (2).

SEISURA INQUIETA; *Turdus inquietus*, Latham: Gould's *B. Austr.* II. 87.

\*RHIPIDURA (?) MOTACILLOIDES, Vigors and Horsfield: Gould's *B. Austr.* II. 85.

\* Gould, in his 'Birds of Australia,' restricts the range of C. HARMONICA to E. and S. Australia, and of C. SELBII to Tasmania. We have, however, both types alike from Port Philip or Victoria land and Van Dieman's land: but, in each case, offering a certain amount of difference. C. SELBII, from Port Philip, has rather a small bill, the throat is but slightly albescent, and the breast not at all so, but uniform brownish-ashy, passing to sullied white on the belly and lower tail coverts. Length of bill to gape  $1\frac{1}{4}$  in., in the Tasmanian bird  $1\frac{1}{2}$  in.; of closed wing respectively  $5\frac{1}{2}$  in., and 5 in.; and tail  $4\frac{1}{2}$  and 4 in.: the Port Philip bird being thus the larger of the two, but having a conspicuously smaller bill. The Tasmanian C. HARMONICA accords in dimensions with the continental race; but its plumage is altogether browner, having the ashy tinge much weaker.

GRAUCALUS MENTALIS, Vigors and Horsfield: Gould's *B. Austr.* II. 56. (4).

ARTAMUS SORDIDUS; *Turdus sordidus*, Latham: Gould's *B. Austr.* II. 27. (2).

\*A. LEUCOPYGIALIS, Gould's *B. Austr.* II. 33. Of two specimens sent, one is wholly undistinguishable from A. LEUCORHYNCHUS, (L), from the Andaman islands (!); while the other has rather more of white upon the rump.

MANORHINA GARRULA; *Merops garrulus*, Latham: Gould's *B. Austr.* IV. 76.

\*PLECTORHYNCHA LANCEOLATA, Gould's *B. Austr.* IV. 47.

\*MELITHREPTUS GULARIS, Gould's *B. Austr.* IV. 71.

ENTOMYZA CYANOTIS; *Gracula cyanotis*, Latham: Gould's *B. Austr.* IV. 68.

\*TROPIDORHYNCHUS CITREOGULARIS, Gould's *B. Austr.* IV. 60. (2).

ACANTHOGENYS RUFOGULARIS, Gould's *B. Austr.* IV. 53. (2).

\*PTILOTIS SONORUS, Gould's *B. Austr.* IV. 33.

\*OCYPHAPS LOPHOTES; *Columba lophotes* Temminck, Gould's *B. Austr.* V. 70. (2).

GEOPELIA TRANQUILLA, Gould's *B. Austr.* V. 73. (L).

DROMAIUS NOVÆ-HOLLANDIÆ; *Casuaris novæ-hollandiæ*, Latham: Gould's *B. Austr.* VI. 1. Young.

ERYTHROGONYS CINCTUS, Gould's *B. Austr.* VI. 21.

\*ARDEA PACIFICA, Latham: Gould's *B. Austr.* VI. 52. (2).

BOTAURUS MELANOTUS, G. R. Gray: Gould's *B. Austr.* VI. 64. (2).

LARUS (GABIANUS) PACIFICUS, Latham, *apud* Bonap., *nec apud* Gould; young. We have another Australian example in similar plumage; and a third, from the Cape of Good Hope, in adult plumage (*J. A. S.* XXIX. 101.). A much larger bird, otherwise similar, but of which the black of the mantle of the adult is less intense, we also possess, from Australia: and this I take to be L. (GABIANUS) GEORGI, King, *apud* Bonap. (*pacificus* *apud* Gould's *B. Austr.* VII. pl. 19): but Mr. Gould combines, in his figure of the adult, the greater size of the latter race, with the deeper-black mantle of the former; stating, that his figures are about two-thirds of the natural dimensions. Length of closed wing, of the larger race,  $18\frac{1}{2}$  in.; of the smaller, 15 in.

XEMA NOVÆ-HOLLANDIÆ; *Larus novæ-hollandiæ*, Stephens: Gould's *B. Austr.* VII. 20.

\**THALASSEUS POLIOCERCUS*, Gould's *B. Austr.* VII. 24.

\**PHALACROCORAX CARBOIDES*, Gould's *B. Austr.* VII. 66.

Undistinguishable, so far as I could perceive, from *PH. CARBO* of the northern hemisphere.

The Reptile is—

*HYDROSAURUS VARIUS*; *Lacerta varia*, Shaw. Specimen exceeding 55 in. in length; and distinct from another Australian *HYDROSAURUS* in the Society's Museum, which I have hitherto supposed to be the *H. VARIUS*. The latter may be described as

*H. OCELLARIUS*, nobis, *n. s.* Scales on the head and face very much smaller than in *H. VARIUS* and *H. SALVATOR*; those on the neck also smaller; and the transverse rows of scales upon the tail are uniform in size throughout, and on its lower surface are much smaller than in the others: the claws also are weaker and less hooked. Colour blackish; a yellow stripe from the eye, and another from the gape continued along the sides of the neck: sides of the body with numerous transverse rows of yellow rings, which are continued across the back more distinctly posteriorly: a series of well-defined narrow yellow stripes crossing the tail, the tip and under surface of which are spotless yellowish; rest of the under-parts freckled with black scales: limbs spotted and barred with yellow, including the upper surface of the toes. Length of specimen about 32 in.\*

The Fish is—

*HETERODONTUS PHILIPPI*; *Squalus Philippi*, Bloch Schneider; *Cestracion Philippi*, Agassiz; *C. Quoyi*, de Framenville. 'Port Jackson Shark.'

VIII. Bábu Rajendra Mallika. Several dead animals: among them a bull Gayál (*BOS FRONTALIS*); a doe fallow deer; a large male pig-tailed monkey (*INUUS NEMESTRINUS*); and a hybrid monkey, a cross between the preceding individual and a female of the Cape

\* Specimens of a *HYDROSAURUS* from the Andaman and Nicobar islands appear to differ only in colouring from *H. SALVATOR*; the transverse rows of *ocelli* upon the body being rarely traceable, however, faintly, while the entire upper surface is besprinkled with dull yellow scales. The *H. SALVATOR* I obtained at Mergui; and *MONITOR DRACONA* at Patpoung, upper Martaban. The length which Dr. Gray assigns to his Australian *H. GIGANTEUS*, viz. 78 in., is commonly attained by *H. SALVATOR*. We have one of that length from Ceylon, and have seen several from Lower Bengal. It appears to be the ordinary length of the full grown animal.

Baboon (*CYNOCEPHALUS PORCARIUS*). The last is, I believe, the first instance of a *hybrid monkey* on record. The infantile specimen resembles much the young of the *NEMESTRINUS*, but has the considerably more developed tail of the *PORCARIUS*. The two parents had been long kept together.

IX. Lt. Beavan, now with the Darjiling sappers. Skull of an Otter (*ONYX*), killed near the road from Calcutta to Barrackpore. Also sundry birdskins.

X. Lt. Forbes, late 2nd B. N. I. A pair of *TETRAOGALLUS TIBETANUS*, Gould.

XI. Lt. Campbell, H. M. 90th Regt. A skin of *DIOMEDEA EXULANS*, L.

XII. His Excellency Earl Canning, Viceroy and Governor-General of India. The carcass of an adult male Giraffe. I much wished to have had this prepared as a stuffed specimen; but owing to the protracted absence from duty of our head taxidermist, the skin could not be properly set up. The skeleton, however, has been preserved; and is that of a considerably larger animal than was the female already mounted as a skeleton, the carcass of which was presented to the Society by Viscount Hardinge.

XIII. Lt.-Col. Nuttall, late in command of the Arakan battalion. A few bottles of snakes, of well known species; and one containing numerous specimens of *TEREDO NAVALIS* extracted from their perforations. A water snake in this collection, new to the Society's museum, is the *ATURIA CAPENOIDES* of Gray's Catalogue of the snakes in the British Museum.

XIV. J. F. Galiffe, Esq. Several living examples of *GECKO VERUS*, from the vicinity of Calcutta.

XV. J. H. Gurney, Esq., M. P., of Catton Hall, near Norwich. Skin of *FALCO PEREGRINUS*, L., from Inverness; *MILVUS ATER*, (Gmelin), ♀ from Tangier, and specimen in immature plumage; *M. AFFINIS*, Gould, from Australia; *GYPS vulgaris*, Savigny, (*G. Ruppellii*, Pr. Bonap), young, from Natal, *SERINUS MERIDIONALIS*, Pr. Bonap, 2♂ 1♀, from Algeria and *ARDEOLA COMATA*, (Pen.) in winter dress, from Natal.

Mr. Gurney writes—"I have a good series of kites from China and one specimen from Japan; but my series of Indian kites is not so good as it ought to be, and I have none from Ceylon. I have not a

sufficient series of Indian kites to make a satisfactory comparison between them and the Chinese.

"I have one or two small Indian kites which appear to me to be identical with the *MILVUS AFFINIS* of Australia: *M. AFFINIS* I have also received from Macassar; and I have some Chinese kites which appear quite adult and in which the pale streaks have entirely disappeared, as in adult specimens from India.

"I have never yet been able to discover any difference in the plumage of old and young specimens of *M. AFFINIS*—which is remarkable, as there is so great a difference in the case of *M. GOVINDA* and *M. ATER*, and also a difference (though much less) in the case of *M. PARASITICUS*.

"The British Museum contains adult specimens of the Falcon which I presume you identify with *F. CALIDUS* of Latham; but I have a suspicion that the true *F. PEREGRINUS* is sometimes found in India, as well as *F. CALIDUS*.

"Capt. Irby has brought a Falcon from Oudh which appears to Mr. Selater and myself to belong to an undescribed species intermediate to *F. CALIDUS* and *F. LANARIUS* of Schlegel (*Feldeggi*, auctorum). Besides Capt. Irby's specimen, which he has kindly presented to the Norwich museum, we have two other examples of this Falcon there—one said to be from Abyssinia, the locality of the other unknown. The late E. I. Company's Museum contains a fourth specimen brought from Babylon by the 'Euphrates' exploring expedition. (Since published as *F. BABYLONICUS*, Gurney, in *the Ibis*, Vol. III. p. 218).

"*F. PEREGRINATOR* (as you justly say) is a well marked species, and very distinct from all the above. It is singular that it has never yet (so far as I know) been figured in *fully* adult plumage.

"*F. JUGGUR* belongs to a distinct group, in which are two other species, *viz.* *F. SACER*, Schlegel, = *F. LANARIUS*, auctorum,—and *F. POLYAGRUS* of N. America."\*

\* The more typical Falcons appear to me to resolve into—

1. *Arctic or Jer. Falcons* (excluding certain species from Australia and N. Zealand).

2. *Desert Falcons*. The Lanner group, to which *F. SACER*, *F. JUGGUR*, *F. BABYLONICUS*, and *F. PEREGRINOIDES* appertain; and to which the *LERACIDEA* of Mr. Gould approximates, his supposed two species, being (in Dr. Jerdon's, and my own opinion) in all probability but young and old of the same; as also the alleged 'Jer. Falcons' of the Southern Hemisphere.

3. *Cliff Falcons*: consisting of the Peregrine group.

XVI. H. H. The Mahárájá of Burdwán. The stuffed skin of a two headed calf.

XVII. Mr. C. K. Hamilton, Calcutta. A canine tooth of the great 'Elephant-seal,' or 'Sea-elephant' MORUNGA PROBOSCIDEA, (Desmarest).

XVIII. Mr. Morgan. A small common Rat (*MUS DECUMANUS*), with abnormally developed rodent-tusks.

XIX. Major W. A. Anstruther Thomson, Commander of the Viceroy's Body-guard. A Cuttle-fish common in the Bay of Bengal.

XX. Lt. W. G. Murray, Topographical Assistant G. T. Survey. A box of bird skins from the Dholpur and Gwalior territories. The only noteworthy specimen is that of a female *PROPASSER* of Hodgson, which cannot be referred to any of the species hitherto recognised :—

*PR. MURRAYI*, nobis, *n. s.* Most nearly affined perhaps, to *PR. RODOPEPLA* (Vigors) ; but the bill much smaller, shaped more as in *PR. RODOCHROUS*, (Vigors), though more elongated and distinctly approximating in form to that of *PROCARDUELIS*, Hodgson. Colour brown above, paler below, a little rufescent on the rump, belly, and upper and lower tail-feathers ; very indistinctly striated, except on the crown where the feathers have contrasting pale lateral edges : a tolerably distinct rufescent whitish supercilium ; and the throat also rufescent whitish, with dusky spots towards and upon the chin : greater and less wing-coverts pale-tipped, and tertiaries pale-margined, the secondaries much more narrowly pale-margined. Bill and feet corneous. Length about  $6\frac{1}{2}$  in. ; of closed wing 3 in. ; and tail  $2\frac{1}{2}$  in., bill to frontal point  $\frac{9}{16}$  in. The male will, of course prove to be more or less crimson like that of its congeners.

A very fine new species of this Genus has lately been obtained by Lieut. Beavan of the late 62nd B. N. I., on Tonglu mountain (10,000 ft.), on the Sikhim frontier bordering on Nipál ; together with other novelties in the bird class, and several known species that are rare in collections. I avail myself of this opportunity to introduce the former.

*PR. FRONTALIS*, nobis, *n. s.* Most resembling *PR. RODOPEPLA*, (Vigors), but the bill smaller, and the tail longer. Broad frontal band, supercilia, and feathers of cheeks and throat, consisting of elongated plumes, vinaceous with glistening whitish medial line more or less developed, the entire feathers composing the frontal band being thus whitish ; rest nearly as in *PR. RODOPEPLA*, but without the ruddy

tinge above, or the pale spots on centre of back, and the upper tail-coverts (as well as the feathers of the rump) are broadly tipped with rosyvinaceous; crown, nape, and back, deep brown with a blackish central streak to each feather; tertiaries margined with whitish, greater wing-coverts the same towards their tips, and the next range of wing-coverts having each an oval terminal spot; axillaries and under-coverts of the wing white; primaries and tail dusky; bill and feet brown. The female is similar to the male above, but has no frontal band, the supercilia are whitish, and the rump feathers are margined with golden fulvous; throat and breast rufous, the cheeks and sides of the throat and the abdominal region, whitish, with a strongly marked black median line to each feather. Length of wing  $2\frac{1}{4}$  in., of tail 3 in.; tarse  $\frac{7}{8}$  in. Female rather smaller. From Tonglu mountain.

Also a very fine new species of true Bullfinch, being the fourth now known to inhabit the Himalaya.

*PYRRHULA ERYTHACA*, nobis, *n. s.* Upper parts pure ashy, like the back of *P. VULGARIS*, Ray, also the front of the neck becoming whitish on the throat; pectoral region fine red; the abdominal pale ashy, and the lower tail-coverts white; a broad white band on the rump, as in *P. VULGARIS*, above which is a slight black band, and the upper tail-coverts and tail are rich purple-black, the middle tail feathers being  $\frac{3}{4}$  in. shorter than the outermost; a black ring encircles the bill, and spreads over the loreal region, this ring being bordered and set off with white; wings black, except the smallest coverts which are grey, and a brownish-grey band ( $\frac{1}{2}$  in. broad) tipping the greater coverts; no red mark upon the tertiaries. Bill black and feet pale. Length of wing  $3\frac{3}{8}$  in., and of tail 3 in. This fine species is as large as *P. NIPALENSIS*, Hodgson, and serves to link that somewhat peculiarly coloured species with its congeners. The female is unknown. From Tonglu mountain.

*PARUS BEAVANI*, nobis, *n. s.* Like *P. RUFOUCHALIS*, nobis, of the N. W. Himalaya, but the black much less extended upon the breast as in *P. MELANOLOPHUS*, Vigors; no trace of rufous, on the white nuchal spot, but the axillaries and lower tail-coverts are of this hue. From Tonglu mountain.

*ANTHUS ROSACEUS*, Hodgson. This is not the *A. CERVINUS*, Pallas, of China, Upper Pegu, and also the Andaman islands. The upper parts are much darker, the ear-coverts are duskyish whereas in the other



they are light rufous like the supercilia, which latter are also whitish in the bird from Tonglu, contrasting strongly with the dark crown and ear-coverts. In the other race the supercilia are of the same hue with the lores and cheeks (*A. rufosuperciliaris*, nobis, *passim*). The throat, also, in the Tonglu specimen is much paler than in the other.

A specimen of a *CORYPHEDEA* in Lt. Beavan's collection is of an extraordinary pale grey colour, nearly as in *ALAUDA RAYTAL*, (B. Ham.) ; but I cannot venture to describe it as a distinct race.

*P. S.* The following letter on the *Cetacea* of the Chinese Seas, from R. Swinhoe, Esq., British Consul at Formosa, will be read with interest.

"Some time ago you asked me for information about Whales, in these Seas. I have kept your request in mind, though I have not till now succeeded in meeting with any one who could give me information on the subject. My informant was many years at Swatow, off which port more Whales have been seen than elsewhere on this coast, and I will now narrate what I have been able to gather from him. Whales visit the Straits of Namoa regularly every May. They are mostly *cows*, and are usually accompanied with their calves some 20 or 30 ft. long. Some of the adults attain the length of 70 feet. When the opium ships were anchored off Namoa island, these cetals used to gambol round them in the night-time, making their proximity known by the loud puffing noise they made, which resembled the sound produced by the piston of a steam-engine. In the day-time they were to be seen putting their long heads out of the water and opening their immense jaws. The Captain of a vessel broke the back of one of them with a cannon-shot, and the animal lashed about the water some hours before he died. He drifted on shore eventually on Namoa island, and was cut up by the native Chinese. Some enterprising Americans at Hong-Kong, on hearing of the occurrence of Whales in this Strait, fitted out a *lorcha* for their capture. The whalers landed at Swatow, built huts and erected boiling-vats, and then started to the pursuit. They soon, however, returned from the expedition, saying that the Whales were only *Razor-backs*, the same with those found off San Francisco, which are dangerous creatures to meddle with, and yield too little oil to compensate for the trouble and risk incurred in their capture. The whalers took down their gear and returned to Hong-Kong. These Whales have very large flat heads, and *smooth* backs. Some

ten or eleven years ago American whalers used to rendezvous at Hong-Kong, and thence send their oil to the States ; but the *citizens* that had settled in the colony treated them so badly and cheated them so much, that they now seldom come there, preferring to make their head-quarters at the Sandwich islands.

“ Some time in spring last year a large Whale was stranded on the sand-spit at Takow (Formosa) ; and I hear that scarcely a year passes but one is stranded somewhere in the vicinage of Swatow.

“ In May 1860, I saw a huge beast of the Whale kind thrust himself half out of the water, when I was on my way from Hong-Kong to Amoy in the Mail-Steamer.

“ Of other cetals, I know only of the large *White Porpoise* that visits Amoy and other southerly harbours from the Sea. I have striven in vain to procure specimens, but may yet succeed.”



JOURNAL  
OF THE  
ASIATIC SOCIETY.

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SUPPLEMENTARY NUMBER.

*Colonel Cunningham's Archæological Survey Report for 1861-62,  
communicated by the Government of India.*

FROM

COLONEL A. CUNNINGHAM,  
*Archæological Surveyor to the Govt. of India,*

TO

THE SECY. THE GOVT. OF INDIA,  
*Public Works Department.*

*Dated Nynee Tal, 3rd June, 1862.*

SIR,

I have the honor to transmit an abstract Report of my proceedings as Archæological Surveyor to the Government of India, for the months of December 1861 and January 1862, being just one-half of my work for the past season. The Abstract Report for the months of February and March will follow in about a fortnight hence.

2. In explanation of the delay that has occurred in the submission of this Abstract of my proceedings, I beg to explain that I had at first intended to draw up only a mere outline of what had been done, but I found it quite impossible to make such a meagre statement sufficiently intelligible. I therefore deemed it better to draw up a more detailed Report, which should give a tolerably full account of all the more interesting and important discoveries at once, leaving all the maps, detailed drawings, and inscriptions, to accompany my complete Report, which will be submitted on or before the 1st of October next. That month I propose to devote to the gleaning up of as much information as possible, regarding the numerous places which I am to visit during the next season.

3. I have already made considerable progress in reducing the inscriptions and maps to a size sufficiently small for publication. It is not necessary to say anything regarding the usefulness of the maps, but with respect to the inscriptions, my experience has taught me that the translations of even our best scholars are not free from errors, and that it is quite impossible to attempt any revised translations without having fac-similes of the original inscriptions. With the object of furnishing reliable fac-similes for the use of scholars, I have made impressions of all the inscriptions that I have met with, and I am now engaged in reducing them with my own hand.

I have the honor to be,

SIR,

Your most obedient servant,

A. CUNNINGHAM, *Colonel,*

*Arch Surveyor to the Govt. of India.*

FROM

COLONEL A. CUNNINGHAM,

*Archæological Surveyor to the Govt. of India,*

TO

LIEUT.-COL. R. STRACHEY, R. E.

*Secy. to the Govt. of India, P. W. Dept.*

*Dated Nynee Tal, 11th October, 1862.*

SIR,

I have now the honour to forward the remaining portion\* of the Report of my proceedings, as Archæological Surveyor to the Government of India, for the months of February and March, 1862. This portion of the Report has extended to a much greater length than I anticipated, being more than double that of the former portion. It has been completed for some time, but I have delayed its submission for the purpose of re-examining it throughout, whilst I was engaged in the preparation of the numerous plates necessary for its illustration. These plates are now nearly ready, but as the Report is complete in itself without them, I beg to submit it at once before beginning my exploring operations for the ensuing cold weather of 1862-63.

2. In a few days I will again address you regarding the various ruined buildings, sculptures, and other ancient remains, which I

\* From para 101.

deem worthy of being illustrated by photography, according to Lord Canning's intention. In the mean time I beg to submit a photograph of a piece of sculpture which I have lodged in safety at Benares. It represents the celebrated goddess of the later Buddhists, named *Vajra Vardhi*, and is in most excellent preservation. This goddess is frequently mentioned in my Report.

3. I propose to commence my operations for the ensuing season by exploring the ruins of Sankassa, an ancient city near Futtehgurh, the remains of which I discovered in 1842. It was celebrated amongst the Buddhists as the spot on which Buddha descended from heaven by a golden ladder. From thence I propose to visit Kanoj, Fyzabad, and Sultanpoor, and other places in Oudh, Kausâmbi on the Jumna, Mathura and Delhi, and lastly Khalsi-Kangra, at the exit of the Jumna from the higher range of hills. At Khalsi there is a huge rock covered with one of Asoka's inscriptions, in which the names of the five Greek Kings are all distinctly legible.

I have the honor to be,

SIR,

Your most obedient servant,

A. CUNNINGHAM, Colonel,

*Archæological Surveyor to the Govt. of India.*

*Abstract Report of operations of the Archæological Surveyor to the Government of India during the season of 1861-62.*

In the explorations which I have carried out during the past season, I have adhered strictly to the plan of proceedings sketched in the Memorandum which I submitted to the Governor-General in November, 1861. I began work in December at Gaya; and after exploring all the places of antiquarian interest in Bihar, Tirhut, and Chumparan, I visited several ancient sites in Goruckpore, Azimgurh, and Jaunpore on my way to Benares, where on the 3rd April, I closed work for the season. I will now give a brief sketch of my operations at the different places in the order in which I visited them:—

I.—GAYA.

2. There are two places of the name of Gaya, one of which is called *Buddha Gaya*, or Buddhistical Gaya, to distinguish it from the city of Gaya, which is situated six miles to the northward. In Gaya itself there are no ancient buildings now existing; but most of the

present temples have been erected on former sites and with old materials. Statues, both Buddhistical and Brahmanical, are found in all parts of the old city, and more especially about the temples, where they are fixed in the walls, or in small recesses forming separate shrines in the court-yards of the larger temples. I have noted the names and localities of all these statues.

3. The inscriptions at Gaya are numerous; but owing to the destruction of the ancient temples, there are but few of them in situ, or attached to the objects which they were originally designed to commemorate. I have taken copies of all the inscriptions, of which the most interesting is a long and perfect one, dated in the era of the *Nirvān*, or death of Buddha. I read the date as follows :

*Bhagavati parinirvritte Samvat 1816 Kārtike badi 1 Budhe*

that is, "in the year 1816 of the emancipation of Bhagavata on Wednesday, the 1st day of the waning moon of Kārtika." If the era here used is the same as that of the Buddhists of Ceylon and Burmah, which began in 543 B. C., the date of this inscription will be  $1816 - 543 = \text{A. D. } 1273$ . The style of the letters is in keeping with this date, but is quite incompatible with that derivable from the Chinese date of the era. The Chinese place the death of Buddha upwards of 1,000 years before Christ, so that according to them the date of this inscription would be about A. D. 800, a period much too early for the style of character used in the inscription. But as the day of the week is here fortunately added, the date can be verified by calculation. For the reckoning of Hindu dates I have prepared elaborate Tables which render the operation a comparatively easy one. From these Tables I deduce the date of the inscription to correspond with Wednesday, the 17th September, A. D. 1342. This would place the *Nirvāna* of Buddha in 477 B. C., which is the very year that was first proposed by myself as the most probable date of that event. This corrected date has since been adopted by Professor Max Müller.

4. Some of the inscriptions, though less interesting, are still valuable for the light which they will throw upon the mediæval period of Indian history. Several Rajas are mentioned in them; and in one of them the date is very minutely detailed in several different eras.

5. The most noteworthy places at Gaya are the temples of *Vishnu-pad*, or "Vishnu's feet;" of *Gadādhara*, or the "maße-bearer," a title of

Vishnu, and of *Gayeswari Devi*. The figure in this last temple is however that of Durga slaying the Buffalo, or Maheshasur; but as the destruction of the Asur Gaya is universally attributed to Vishnu, this temple must originally have contained a statue of that god as Gayeswara Deva, or the "lord of Gaya." Several interesting sculptures, and one long and well preserved inscription, are also to be seen at the *Krishna Dwârîka* temple.

6. In the neighbourhood of the Vishnu-pad there is a deep tank called Suraj Kund, to the west of which is a temple to *Surya*, or the Sun. The vestibule of this temple is formed of two double rows of pillars, all ten feet in height, and all leaning more or less to the north. There are five pillars in each row. The whole temple, both inside and outside, has been repeatedly white-washed, so as almost to conceal the ornaments of the pillars. One long inscription was found inside, and a second was afterwards obtained by scraping off the thick coating of white-wash from a part of the wall pointed out by a good-natured Brahman. This inscription was the valuable one first mentioned as containing a date in the era of the death of Buddha.

7. The several hills in the immediate neighbourhood are also esteemed holy, and are accordingly crowned with temples. The highest of these, to the south of the town, is called *Brahmjûin*, or *Brahma-yoni*, the temple on its summit being dedicated to the *Sakti*, or female energy of Brahma, whose five-headed statue is enshrined in the temple. This hill is 450 feet in height, and very steep on the town side. But the ascent has been rendered easy to pilgrims by the erection of a long flight of steps from the base to the summit by the Mahratta Deva Rao Bhao Saheb, since the accession of the present Maharaja Jayaji, of Gwalior, that is, within the last 18 years, as recorded on an inscription slab let into the pavement.

8. To the north of the town the granite hill of *Ramsila* rises to a height of 372 feet. The granite temple on its summit contains a lingam called *Pâtdleswara* Mahadeva, as well as small figures of Siva and Parbati. The upper portion of this temple is modern, being constructed of various ancient fragments that do not fit well together, and which are in some instances placed upside down. The lower part of the temple, from 8 to 10 feet in height, is undoubtedly old; and perhaps the date of 1071 Samvat, or A. D. 1014, found on one of the blocks of the granite pavement, may record the actual period



of the erection of the temple. The basement mouldings are strikingly bold and effective.

9. To the north-west of the town, the hill of *Pretsila* bears a small temple erected by Ahalya Bai to pacify the ghost or spirit (*preta*) who is said to dwell in the hill. I could learn nothing of the origin of this spirit, who is held in great awe, from which I infer that he is identical with Yama, the god of death, one of whose titles is *Pretaraja*, or king of ghosts, that is, of departed spirits. The hill is 541 feet in height, and its rocks are believed to contain gold. The shrine is much frequented by pilgrims who seek to appease the dread spirit by their offerings. There is a curious serpentine road leading from the foot of Ramsila to Pretsila. The road has been metalled, and trees have been planted on both sides of it, by some wealthy devotee.

10. *Ram Gaya* is a small hill on the eastern bank of the Phalgu river, opposite Brahmjuin. There are some ruins and broken statues scattered about it, but nothing of any interest, except one short inscription of *S'ri Mahendra Pdla, Deva*, dated in the 8th year of his own reign, or of some new era.

## II.—BUDDHA GAYA.

11. Buddha Gaya is famous as the locality of the holy Pipal tree, under which Sakya Sinha sat for six years in mental abstraction, until he obtained Buddhahood. A long and detailed account of this sacred place is given by the Chinese Pilgrim Hwen Thsang, between the years A. D. 629 and 642. He describes minutely all the temples and statues which surrounded the celebrated Pipal tree, known throughout the Buddhist world as the *bodhi-drum*, or "tree of knowledge." Several of the objects enumerated by the Chinese Pilgrim I have been able to identify from their exact correspondence with his description.

12. The celebrated Bodhi tree still exists, but is very much decayed; one large stem with three branches to the westward is still green, but the other branches are barkless and rotten. The green branch perhaps belongs to some younger tree, as there are numerous stems of apparently different trees clustered together. The tree must have been renewed frequently, as the present Pipal is standing on a terrace at least 30 feet above the level of the surrounding country. It was in full vigour in 1811, when seen by Dr. Buchanan

(Hamilton), who describes it as in all probability not exceeding 100 years in age. Hwen Thsang also describes an early renewal by King *Purna Varmma* after its destruction by King *Sasangka*, who dug up the ground on which it had stood, and moistened the earth with sugar-cane juice to prevent its renewal.

13. Immediately to the east of the Pipal tree there is a massive brick temple, nearly 50 feet square at base and 160 feet in height, from the granite floor of the lower story to the top of its broken pinnacle. This is beyond all doubt the *Vihar*, from 160 to 170 feet in height, described by Hwen Thsang as standing to the east of the Bodhi tree. Its base was about 20 paces square. It was built of bluish bricks plastered with lime; it was ornamented with niches in stages, each niche holding a golden statue of Buddha, and was crowned with an *amalaka* fruit in gilt copper. The existing temple, both in size and appearance, corresponds so exactly with this description, that I feel quite satisfied it must be the identical temple that was seen by Hwen Thsang. The ruined temple, as it now stands, is 160 feet in height, with a base of rather less than 50 feet square. It is built entirely of dark red brick of a bluish tinge, and has formerly been plastered all over. Lastly, the walls are ornamented externally with eight tiers, or rows, of niches, many of which still hold figures of Buddha. These figures are made of plastered brick, but they were no doubt formerly gilt, as is done with the plaster statues of the Burmese at the present day. There is, however, no trace of the copper gilt *amalaka* fruit. I have thus been particular in noting the points of correspondence between the two temples, because there seems to me to be a very strong probability that the existing temple was originally built by the celebrated *Amara Sinha*, the author of the *Amara Kosha*, as I will now proceed to show.

14. On the site of this temple, according to Hwen Thsang, there was originally a small *Vihar* built by Asoka between 259 and 241 B. C. Afterwards a new temple of very great size was built by a Brahman in compliance with the instructions of the god *Indra* conveyed to him in a vision. Inside the temple was placed a statue of the ascetic Buddha as he appeared when seated in meditation under the Bodhi tree. The statue was 11 feet 5 inches in height, 8 feet 8 inches in breadth across the knees, and 6 feet 2 inches across the shoulders. The figure was sitting cross-legged facing the east.

Now these particulars correspond almost exactly with the arrangements of the present building. Its doorway is towards the east, and consequently the enshrined statue must have faced toward the east. The statue itself has long ago disappeared, but its pedestal still remains in good order. Its dimensions are as follows :—length 13 feet 2 inches, breadth 5 feet 8 inches, and height 4 feet  $\frac{1}{2}$  inch, which measurements agree most closely with those recorded by Hwen Thsang; namely, 12 feet 5 inches in length by 4 feet 2 inches in height. Considering how exactly both the temple and the pedestal of the figure correspond in size and in other respects with the description of Hwen Thsang, I think there can be no reasonable doubt that the present temple is the same that was seen by him in the 7th century of our era.

15. Now in an inscription dated in A. D. 948, which was found at Buddha Gaya, and translated by Sir Charles Wilkins, the author of the record ascribes the building of this temple and the erection of an image of Buddha to the illustrious *Amara Deva*, who is stated to have been one of the nine gems of the Court of King Vikramaditya. The last fact serves at once to identify Amara Deva with Amara Sinha, the author of the *Amara Kosha*, who as a contemporary of *Varāha Mihira* and *Kālidāsa* must have lived in A. D. 500. In this inscription the temple is said to have been erected in compliance with the command of Buddha himself, conveyed to him in a vision.\* Here then we have same story that is found in Hwen Thsang. In both statements a Brahman in a vision receives command from a god to build a temple, with an enshrined figure of Buddha. The correspondence is complete, excepting only one curious point of difference in the name of the god, whom the Buddhist Hwen Thsang describes as the Brahmanical Mahadeva, but whom the Brahmanist recorder of the inscription calls Buddha himself.

16. Now the holy places at Buddha Gaya were visited between A. D. 399 and 414 by another Chinese pilgrim Fa-Hian, but his account of them is unfortunately very brief. It is, however, sufficient to show that there was no temple in existence at that date. Fa-Hian notes the spot where Buddha, seated on a stone under a great tree, ate some rice presented to him by two maidens. The stone still exists, and is described by him as about 6 feet in length and breadth, and 2 feet in height. Now there is a large circular stone

5 feet  $7\frac{1}{2}$  inches in diameter, and about 2 feet high in the small temple of *Vageswari Devi*, which is most probably the identical stone described by Fa-Hian. It is a blue stone with whitish veins, and the surface is covered with minute ornament.

17. From all the facts which I have brought forward, such as the non-existence of any temple in A. D. 400, the recorded erection of a large one by Amara Deva about A. D. 500, and the exact agreement in size as well as in material and ornamentation between the existing temple and that described by Hwen Thsang between A. D. 629 and 642, I feel satisfied that the present lofty temple is the identical one that was built by the celebrated Amara Sinha about A. D. 500.

18. Further information regarding this temple is to be found in the Burmese inscription discovered at Buddha Gaya by the Burmese Mission in 1833, and translated by Colonel Burney. Another earlier translation by Ratna Pala was published by James Prinsep. In this inscription the dates have been read differently by the two translators; Ratna Pala and James Prinsep reading 667 and 668, while Colonel Burney and his Burmese assistants read 467 and 468. I have carefully copied this inscription, and I am thus enabled to state positively that Colonel Burney was certainly wrong in adopting the earlier date in compliance with the views of the Burmese priests, whose object it was to reconcile the date of the inscription with their own history. James Prinsep remained unconvinced by Colonel Burney's arguments, and appended a note to his translation, in which he states that the first figure of the upper date might be a little doubtful, but that the first 6 of the lower date seemed to him quite plain, and essentially different from the 4 which occurs in the second line of the inscription. The two dates of 667 and 668 of the Burmese era, as read by Ratna Pala, correspond with A. D. 1305 and 1306.

19. In this Burmese inscription the erection of the original temple is ascribed to Asoka, as recorded also by Hwen Thsang. Having become ruined, it is said to have been rebuilt by a priest named *Naik Mahanta* according to Ratna Pala, or by a lord named *Penthagu-gyi* by Colonel Burney. Where the term "priest" is used by Ratna Pala, Colonel Burney gives "lord," because, as he states, it is not now customary to say *ta-youk* of a priest, although in former times both priests and laymen are said to have been styled *youk*. The Burmese affix *gyi*, which means "great," has apparently been translated

into the Indian *Nayak*, or Chief, and *Penthagu* which Colonel Burney regards as a proper name, and which would therefore be *Pensagu* in Indian pronunciation, is rendered Mahanta by Ratna Pala. I cannot pretend to reconcile these differences myself; but I will submit a copy of the inscription to Colonel Phayre, whose intimate knowledge, both of the Burmese language and of the Buddhist history, will enable him to give an authoritative opinion on the disputed points of this interesting record. One thing is quite clear, if these different records are to be reconciled, namely, that *Penthagu-gyi* (or *Naik Mahanta*) should represent the Brahman of Hwen Thsang, and also the celebrated Amara Deva of Wilkins's inscription.

20. The Burmese inscription goes on to say that the temple after being again destroyed was rebuilt by King *Thado*. Then having once more become ruinous, the "Lord of the White Elephant and the great King of Righteousness" deputed *Sri Dharmmapada Rajaguna* to rebuild it for a third time. After some delay the work was begun in A. D. 1305, and the temple was consecrated in the following year 1306.

21. In front of the Great Temple there is a small open temple of four pillars covering a large circular stone, with two human feet carved upon it. This temple is now called *Buddhapad*; but there can be little doubt that it is the same that is mentioned in the Amara Deva's inscription under the name of Vishnu-pad, or "Vishnu's feet." Originally the feet may have been those of Buddha, which, on the decline of Buddhism, were quietly appropriated to Vishnu by the accommodating Brahmans.

There is a short Nagari inscription on the east side of the stone, giving the date of Saka 1230, which is equivalent to A. D. 1308.

22. There are other points of interest connected with the building of the Great Temple at Buddha Gaya, such as the date of the Brahmanist King *Sasāngka*, who rooted up the Bodhi tree, and placed an image of Mahadeva in the temple, as well as the date of his contemporary the Buddhist *Purna Varmma*, who renewed the Bodhi tree.

23. Close to the Great Temple there is a small plain *Samādh*, or cenotaph over the remains of the earliest Brahmanical *Mahant*. This is of no interest in itself, but the vestibule in front is supported on nine square sandstone pillars, which have once formed part of a

24. Of the 33 ancient pillars above described, there are 10 of sandstone from some distant quarry, and 23 of granite from the neighbouring hills. They are all of the same dimensions and of the same age, as they were the gifts of the same venerable lady Kudrangi. But as the two sets of pillars were found in different localities, although not far apart, I believe that they originally formed different enclosures. The sandstone pillars are said to have been found at the southern side of the Great Temple, and close to the holy Pipal tree. I believe therefore that they originally formed an enclosure round the Bodhi tree. The granite pillars are said to have been discovered about 50 yards to the east of the Great Temple ; and I think it probable that they once formed an enclosure either round the *Vajrâsan* or "Diamond throne," or round the *Buddha-pad*, or temple of "Buddha's feet." A square of six pillars on each side, with one entrance, would require exactly 23 pillars.

25. To the south-east of the Great Têmple there is a small tank, called *Budhokar-Tâl*, which exactly answers the description given by the Chinese pilgrim of the tank of the dragon *Muchalinda*. This agreement is so striking that it was seen at once by the members of the Burmese embassy.

26. There are two small ruined temples to the east of the Great Temple, the nearer one being called *Tāra Devi*, and the further one *Vāgiswari Devi*. But the former temple contains only a standing male

figure, with a short inscription over the right shoulder in characters of about A. D. 1000, *Sri Buddha-Dāsasya*, “(the gift) of the fortunate slave of Buddha.” The goddess Tārā belongs to the later days of Buddhism, after the introduction of Tāntrika doctrines. The other temple contains a seated male figure, holding a lotus in his left hand, and a sword in his uplifted right hand, with a Buddhist tope or solid tower on each side of him.

27. To the north of the Bodhi tree there is a ruined fortress of earth 1,500 feet long by 1,000 feet broad, attributed to Raja *Amara Sinha, Suvira*. This is possibly the same person as the Amara Deva who built the Great Temple, as the arched passage leading to the temple is said to have been built for the convenience of Amara Sinh’s Rani when returning from her morning bath in the Nilājan river to pay her devotions at the shrine. The preservation of the title of Sinha down to the present day would seem to strengthen the supposition of Amara Deva’s identity with the author of the *Amara Kosh*.

28. The remaining antiquities of Buddha Gaya consist of numerous Buddhist statues of all sizes, some placed in small temples, and others scattered about the ruins; but the greatest number of them, and by far the finest, are fixed in the walls of the Mahant’s residence.

29. The existing inscriptions at Buddha Gaya are few in number, and, with one exception, they are of little importance. Two valuable inscriptions translated by Wilkins and James Prinsep are no longer to be found; nor does the Mahant know anything about them. This is the more to be regretted as the former was the record already quoted of Amara Deva and the other had a doubtful date which might have been re-examined. In searching for these, however, I found a new inscription in the pavement of the gateway of the Mahant’s residence. The tenon hinge of the gate works in a socket formed in the very middle of the inscription. There are two socket holes, the second one having belonged to an older gate, or having been cut in the wrong position. This inscription opens with an invocation to Buddha.

### III.—BAKROR.

30. To the eastward of Buddha Gaya, on the opposite bank of the Phalgu or Lilājan River, and immediately to the north of the village of Bakror, there are the ruins of a large brick tope, with a stump of a sand-stone pillar at a short distance to the northward. The

ruined mound, which is called Katani, is 150 feet in diameter at base, and 50 feet high. It is built of the usual large bricks,  $15\frac{1}{2} \times 10\frac{1}{4} \times 3\frac{1}{2}$ . Several excavations have been made in it in search of bricks and treasure. About 70 years ago numerous lac seals impressed with a figure of Buddha were found in excavating this tope. These are engraved in Moor's Hindu Pantheon, Plate LXX. figures 6, 7, and 8, where they are said to have been dug up at Buddha Gaya. My information was, however, derived from the Mahant himself, and as Bakror is only half a mile to the eastward, it would have been more correct to have described the locality as *near*, instead of *at*, Buddha Gaya. The stump of the pillar, which is still in situ, is  $3' 0\frac{1}{4}''$  in diameter, and there is another fragment near a well to the north-west that measures  $3' 0\frac{1}{4}''$  in diameter. Both of these pieces belong to the rough bottom portion of the pillar, which must have been imbedded in masonry. The shaft of this pillar is said to have been taken to Gaya by a former Magistrate. Accordingly in Sâhebgunj, or the new city of Gaya, there is a sand-stone pillar  $2' 4\frac{1}{4}''$  in diameter, and upwards of 16 feet in height, which was set up as a central point in Sâhebgunj, as recorded in a Persian inscription by Charles Bâdam Saheb (Bodham) in A. D. 1789.

31. The tope and pillar of Bakror were visited by Hwen Thsang, who relates a story regarding the capture by a certain king of an "Elephant of perfume," (*gandha-hasti*). In a former existence, as a Bodhisatwa, Buddha was said to have been the son of this Elephant, and a stupa and pillar had accordingly been erected in commemoration of the tradition. There was also a sacred tank, which is perhaps represented by a small walled tank generally called *Mârttand Pokhar*, or *Suraj Kund*, that is, the "tank of the Sun." It is also called *Buddhakund*; but this name was applied by some to a large unwalled tank, about 800 feet square, immediately to the north of the small tank. An annual fair is held at the Suraj Kund, when thousands of pilgrims assemble to bathe in its holy waters. They sit in the water in rows, and repeat, after their attendant Brahmans, the names of all the holy places around Gaya. The ancient name of Bakror is said to have been *Ajayapura*.

#### IV.—PUNAWA.

32. The village of Punâwâ is situated 14 miles to the eastward of Gaya, between two hills of grey granite. To the north there is



a fine old square tank called *Budhokar Tāl*, and to the east another tank called *Karamār Tāl*. The principal object is a pillared temple of *Triloknāth*. As it stands at present, this temple is a modern work made up of different sized pillars of various patterns, some with and others without capitals, so as to bring them to the required height. Half pillars have even been made use of as whole pillars, with the old rough engaged backs left exposed. One of the doorways of hard blue stone is richly sculptured. In the centre is a figure of the ascetic Buddha, with a three-pointed crown over his head, and on each side of him nine figures with joined hands kneeling towards him. The other doorways are of granite, and, though very plain, are evidently of the same age as the more highly ornamented one.

33. Several statues and granite pillars of different sizes are scattered about the foot of the hills. Portions of the usual Buddhist formula, "*Ye Dharmma*," &c., are found upon some of the statues. There are no dates in any of these inscriptions, but the style of their letters fixes their date at about A. D. 1000. To the north-west, on a mound 60 feet square, there are five broken pillars and a broken statue of the three-headed goddess *Vajra-Varāhi*, one of the principal objects of worship amongst the later Buddhists. Two of her heads are human, but the third is that of a hog, and on the pedestal there are seven hogs. The ruined temple on this mound is called *Nārting*.

#### V.—KURKI HAR.

34. About three miles to the north-east of Punâwâ is the large village of Kurkihar. It is not to be found in any of our maps, not even in No. 103 sheet of the Indian Atlas, although it is perhaps the largest place between the cities of Gaya and Bihâr. The remains at Kurkihar consist of several ruined mounds, in which numerous statues and small votive topes of dark blue stone have been found. The principal mass of ruin, about 600 feet square, lies immediately to the south of the village. A second less extensive mound lies to the south-west; and there is a small mound, only 120 feet square, to the north of the village. The last mound is called *Sugatgarh*, or the "house of *Sugata*," one of the well known titles of Buddha. In the principal mass of ruin the late Major Kittoe dug up a great number of statues and votive topes; and a recent excavation on the west side

showed the solid brick-work of a Buddhist stupa. In the north-west corner of this excavation the relic chamber had been reached, and I was privately informed that a small figure and some other remains had been discovered inside. But the head man of the village stoutly denied that anything had been found, and all the villagers *then* denied the discovery also.

35. The principal statue is a squatted figure of the ascetic Buddha under the holy Pipal tree, or *bodhi-drum*. Over head there is a representation of the *Nirvāna*, or death of Buddha, and on the pedestal there is an inscription in three lines, which is incomplete owing to the loss of a projecting corner of the base. To the right and left there are smaller figures of *Máyá* standing under the Sâl tree at the birth of Buddha, and of Buddha himself teaching the law at Benares after his first attainment of Buddhahood. On the mound to the east there is a standing figure of Buddha, with a small attendant figure holding an umbrella over him. As this attendant has three heads, I believe that it represents the Hindu Triad in the humble position of a servitor of Buddha.

36. At the north-east corner of the village there is a small rude Hindu temple of brick, in and about which a large number of statues have been collected. The temple is dedicated to Bâgheswari Devi (Vyâghreswari), but the principal figure inside is a life-size statue of the eight-armed *Durgâ* conquering the Mahishâsur or Buffalo demon. The figure pointed out to me as that of Bâgheswari was a four-armed female seated on a lion with a child in her lap; but I believe that this figure represents either *Indrâni* with her son the infant Jayanta, or *Shashti*, the goddess of fecundity, a form of *Durgâ*. The principal figure outside the temple is a life-size statue of *Akshobya*, who is represented squatted under the Bodhi tree, in the same manner as the ascetic Buddha, with the left hand in the lap, and the right hand hanging over the knee. There is a halo round the head inscribed with the usual Buddhist formula, *Ye Dhamma*, &c.; and near the head there is a short inscription giving the name of the figure "*Tun Akshobya-rajra, hun.*"

37. I procured several short but interesting inscriptions at Kurkihar. The name of *Sākala* is mentioned in several of them, and also *Kerala* in *Dakshinades*. The age of these inscriptions, judging from the shapes of the letters, must be about A. D. 800 to 1,000. I am now employed in making reduced copies of them.

38. The true name of *Kurkihar* is said to be *Kurak-vihâr*, which I believe to be only a contracted form of *Kukkuta-pada Vihâra* or "temple of the cock's foot," which is described by Hwen Thsang. The Sanskrit *Kukkuta* is the same word as the Hindi *Kukkar* or *Kurak* a cock, so that *Kurak-vihâr* is clearly the same appellation as *Kukkuta-pada Vihâra*. There was a monastery also of the same name. These buildings were situated near a three-peaked hill called *Kukkutta-pada-giri* or "cock's foot hill," which was celebrated as the abode of the great *Kâsyapa*, as well as the scene of his death. On this account the hill was also called *Guru-pada parvata*, or "Teacher's foot hill." The situation of *Kurkihar* corresponds exactly with Fa-Hian's account, excepting that there is no three-peaked hill in its neighbourhood. There are, however, three bare and rugged hills which rise boldly out of the plain about half a mile to the north of the village. As these three hills touch one another at their bases, I think that they may fairly be indentified with the three-peaked hill of Hwen Thsang.

#### VI.—GIRYEK.

39. From the neighbourhood of Gaya two parallel ranges of hills stretch towards the north-east for about 36 miles to the bank of the Panchâna River, just opposite the village of Giryek. The eastern end of the southern range is much depressed, but the northern range maintains its height, and ends abruptly in two lofty peaks overhanging the Panchâna River. The lower peak on the east is crowned with a solid tower of brick-work, well known as *Jarasandha-ka-baithak*, or "Jarasandha's throne," while the higher peak on the west, to which the name of Giryek peculiarly belongs, bears an oblong terrace covered with the ruins of several buildings. The principal ruin would appear to have been a *vihâr* or temple on the highest point of the terrace, which was approached by a steep flight of steps leading through pillared rooms.

40. The two peaks are connected by a steep pavement, which was formerly continued down to the foot of the hill opposite the village of Giryek. At all the commanding points and bends of this road are still to be seen the stone foundations of small brick *stupas* from 5 and 6 feet to upwards of 12 feet in diameter. At the foot of the upper slope, and within 50 feet of Jarasandha's Tower, a tank 100 feet square has been formed, partly by excavation and partly by

building up. There is a second tank, at a short distance to the north, formed by the excavation of the rock for building materials. Both of these tanks are now dry.

41. The stupa called *Jarasandha-ka-baithak* is a solid cylindrical brick tower 28 feet in diameter, and 21 feet in height, resting on a square basement 14 feet high. The cylinder was once surmounted by a solid dome or hemisphere of brick, of which only 6 feet now remain, and this dome must have been crowned with the usual umbrella rising out of a square base. The total height of the building could not therefore have been less than 55 feet, or thereabouts. The surface has once been thickly plastered, and the style of ornamentation is similar to that of the Great Temple at Buddha Gaya. I sank a shaft 41 feet in depth from the top of the building right down to the stone foundation; and I continued a gallery, which had been begun many years ago, at the base of the cylinder, until it met the well sunk from above, but nothing whatever was discovered in either of these excavations to show the object of the building.

42. On the west side of Jarasandha's Tower, and almost touching its basement, I observed a low mound which seemed like the ruin of another stupa. On clearing the top, however, I found a small chamber 5 feet 8 inches square, filled with rubbish. This chamber gradually widened as it was cleared out, until it became 7 feet square. At 5½ feet in depth the rubbish gave place to brick-work, below which was a stratum of stones, evidently the rough foundation of the building. In the south-west corner of the brick-work, about one foot below the surface, I found 84 seals of lac firmly imbedded in the mud mortar. The seals were all oval, but of different sizes, generally about 3 inches long and 2 inches broad. All, however, bore the same impression of a large stupa with four smaller stupas on each side, the whole surrounded by an inscription in Mediæval Nāgari characters, *Ye Dharma hetu prabhava*, &c., being the well known formula of the Buddhist faith. Externally this building was square with projections in the centre of each face and similar in its ornamentation to the basement of Jarasandha's Tower.

43. On the eastern side of the Panchâna River, there is an extensive mound of ruins, being half a mile long from north to south, and 300 yards broad in its widest part. There are the remains of two paved ascents on the river side, and of three more on the opposite

side of the mound. In the middle of the mound there is a small mud fort, and at the northern end there are several pieces of sculpture collected together from different places; one of these is inscribed and dated in the year 42 of some unknown era, somewhere about the eleventh century, or perhaps even somewhat later.

44. At two miles to the south-west of the village of Giryek, and one mile from Jarasandha's Tower, there is a natural cavern in the southern face of the mountain, about 250 feet above the bed of the Bānganga rivulet. This cave, called Gidha-dwar, is generally believed to communicate with Jarasandha's Tower; but an examination with torches proved it to be a natural fissure running upwards in the direction of the tower, but only 98 feet in length. The mouth of the cavern is 10 feet broad and 17 feet high; but its height diminishes rapidly towards the end. The cave is filled with bats, and the air is oppressively warm and disagreeable, which alone is sufficient to prove that there is no exit to the cavern, otherwise there would be a draught of air right through it. Vultures swarm about the precipitous cliffs of pale grey horn stone, and I picked up their feathers in the mouth of the cave.

45. The remains at Giryek, which I have just described, appear to me to correspond exactly with the accounts given by Fa-Hian of the "Hill of the Isolated Rock," where Indra questioned Buddha on forty-two points; and with that given by Hwen T'sang of *Indra-Silaguha*, which refers to the same story. Fa-Hian states that there was a stone building on the summit of the hill facing the south, on the spot where Buddha sat when questioned by Indra, and also a monastery; but he makes no mention of any stupa. Hwen T'sang states that on the crest of the hill there were marks in two places where the four former Buddhas had sat and walked. On the eastern peak there was a stupa and also a monastery called the "*Hansa Sanghāramā*" or "Goose's Monastery," to account for which he relates the following legend:—One day when taking exercise, a mendicant, who was the steward of the monastery, saw a flock of geese high in the air, and as the monks of his fraternity, although strictly abstemious, had experienced great difficulty in procuring sufficient food, he exclaimed playfully—"To-day the pittance of the monks is insufficient. O noble beings (*Mahāsattvas*) you ought to have compassion on our circumstances." No sooner had he spoken

these words, than one of the geese fell dead at his feet. The horror-struck mendicant ran to tell the tale to his brethren, who became overwhelmed with grief. "Buddha," said they, "established his law for man's guidance under all circumstances. The *Mahāyāna* (great Vehicle) is the source of truth, while we have foolishly followed the doctrine of the *Hināyāna* (lesser Vehicle). Let us renounce our former opinions. This goose has taught us a salutary lesson, let us do honour to her eminent virtue by transmitting it to the most distant ages." They accordingly built a stupa over the dead goose, which was interred in the base of the monument, and adorned it with an inscription relating the pious devotion of the goose.

46. If my identification of the Giryek Hill with the *Indra-Sila-guha* of Hwen Thsang is correct, there can be little doubt that Jarasandha's Tower is the very stupa that was built in honour of the devoted goose. Only this one stupa is mentioned by Hwen Thsang, and Jarasandha's Tower is the only one now existing on the hill. In further corroboration of this identification, I may mention that close by I found a broken figure with a large goose carved on the pedestal, and further that one of the stupas on the lac seals, found on the spot, appears to bear a goose on its summit. As no mention is made of any stupa by Fa-Hian, the erection of this tower most probably took place between his date and that of Hwen Thsang, or about A. D. 500.

47. The position of Giryek corresponds so exactly, both in bearing and distance, with that of the hill of *Indra-Sila-guha*, that I feel quite satisfied of their identity. No etymology has yet been proposed for the name of Giryek; but it seems to me not unlikely that it is nothing more than *Giri + eka*, "one hill," that is, the Hill of the Isolated Rock of Fa-Hian.

48. Both of the pilgrims mention the cave in the southern face of the mountain, which corresponds exactly with the natural cavern *Gidha Dwar*, which I have already described. *Gidha Dwar*, in Sanskrit *Gridhra-dwāra*, means the vulture's pass, or opening. By Hwen Thsang the cave is called *Indra-Sila-guha*, or "the cave of Indra's stone," being thus named after a stone on which were delineated the forty-two points on which Indra had questioned Buddha. Fa-Hian adds that Indra himself drew the marks upon the stone with his finger.

49. A second cave is described by Hwen Thsang as the Vulture's Cave or Hill of the Vulture's Cave. This name was derived from the story of Ananda's adventure with the demon Māra in the shape of a vulture. The demon suddenly stopped before the cave, and terrified Ananda, when Buddha passing his hand through the rock laid hold of Ananda's arm, and at once removed his fear. The cleft in the rock, said to have been made by Buddha's hand, was seen by Fa-Hian early in the 5th century. Major Kittoe thought that the *Gidha Dwar* cave was the Vulture's Cave of the Chinese pilgrims, but its distance of  $4\frac{1}{2}$  miles from the old capital of *Rājagriha* is too great, as both Fa-Hian and Hwen Thsang place the Vulture's Cave at 15 *li* from old *Rājagriha*, that is, at only  $2\frac{1}{2}$  miles from it. This cave besides answers exactly to that described by Hwen Thsang under the name of *Indra-Sila-Guha*, and the two caves were certainly distinct. I made every enquiry for another cave, but could only hear of one very close to that of *Gidha Dwar*, which was quite inaccessible. But taking the distance and direction from old *Rājagriha*, the Vulture's Cave must have been in the lofty precipitous hill now called *Sailagiri*, or the "Rocky Mountain." *Gidha Dwar* is the name of a narrow pass where the two parallel ranges of hills before described close together within two miles of *Giryek*, and the *Gidha Dwar Cave* is immediately above the pass.

#### VII.—RAJGIR.

50. Whatever doubts may exist regarding the identification of *Kurkihār* and *Giryek*, there can fortunately be none respecting *Rājgir*, as the representative of the ancient *Rājagriha*. The name is still preserved in the modern *Rājgir*, and I found it repeated in numerous inscriptions in the temples on the *Baibhār* and *Vipula Mountains*. The old city of *Rājagriha* is described by Fa-Hian as situated in a valley between five hills, at 4 *li* (or two-thirds of a mile) to the south of the new town of *Rājagriha*. The same position and about the same distance are given by Hwen Thsang, who likewise mentions the hot springs which exist to this day.

51. The old city of *Rājagriha* is called *Kusāgārapura*, or the city of the *Kusagrass*, by Hwen Thsang, who further describes it as the "town surrounded by mountains." This last is almost a translation of *Giri-vraja*, or the city of "many hills," which is the old name of the capital of *Jarasandha*, preserved both in the *Rāmāyana* and

the *Mahābhārata*. Fa-Hian states that the "five hills form a girdle like the walls of a town," which is an exact description of the site of old Rājgir. A similar description is given by Turnour from the Pali annals of Ceylon, where the five hills are named *Gijjhakuto*, *Isigili*, *Webharo*, *Wepullo*, and *Pandawo*. In the *Mahābhārata* the five hills are named *Vaihāra*, *Varāha*, *Vrishabha*, *Rishigiri*, and *Chaityaka*; but at present they are called *Baibhār-giri*, *Vipula-giri*, *Ratna-giri*, *Udaya-giri*, and *Sona-giri*.

52. In the inscriptions of the Jain temples on Mount *Baibhār*, the name is sometimes written *Baibhāra*, and sometimes *Vyavahāra*. It is beyond all doubt the *Webharo* Mountain of the Pali annals, on whose southern face was situated the far-famed *Sattapanni* Cave, in front of which was held the first Buddhist Synod in 543 B. C. This cave still exists under the name of *Son Bhāndār*, or "Treasury of gold."

53. *Ratnagiri* is due east, one mile distant from the *Son Bhāndār* Cave. This situation corresponds exactly with Fa-Hian's position of the "Pipal Tree Cave," in which Buddha after his meals was accustomed to meditate. It was situated at 5 or 6 *li* (about one mile) to the east of the cave of the First Synod. The hill of *Ratnagiri* is therefore identical with the *Pandawo* Mountain of the Pali annals, in which Buddha dwelt, and which in the *Lalita-Vistara* is always styled the "King of Mountains." A paved zigzag road now leads from the eastern side of old Rājagriha to a small Jain temple on the top of *Ratnagiri*, which is frequently visited by Jains. I would identify it with the *Rishigiri* of the *Mahābhārata*.

54. Mount *Vipula* is clearly identical with the *Wepullo* of the Pali annals, and as its summit is now crowned with the ruins of a lofty *stupa* or *chaitya*, which is noticed by Hwen Thsang, I would identify it with the *Chaityaka* of the *Mahābhārata*. Regarding the other two mountains, I have nothing at present to offer, but I may mention that they are also crowned with small Jain temples.

55. The old city between the hills is described by Fa-Hian to be 5 or 6 *li* from east to west, and 7 or 8 *li* from north to south, that is, from 24 to 28 *li* or  $4\frac{1}{2}$  miles in circuit. Hwen Thsang makes it 30 *li* or 5 miles in circuit, with its greatest length from east to west. My survey of the ancient ramparts gives a circuit of 24,500 feet, or  $4\frac{1}{2}$ th miles, which is between the two statements of the



Chinese pilgrims. The greatest length is from north-west to south-east, so that there is no real discrepancy between the two statements as to the direction of the greatest length of the old city. Each of them must have taken his measurement from the Nekpai embankment on the east (which has been described by Major Kittoe) to some point on the north-west. If taken to the Pâñch-Pandu angle of the ramparts, the direction would be W. N. W., and the length upwards of 8,000 feet; but if taken to the temple of Torha Devi, the direction would be N. N. W., and the distance upwards of 9,000 feet.

56. I have already quoted Fa-Hian's statement that the "five hills form a girdle like the walls of a town." This agrees with Hwen Thsang's description, who says that "high mountains surround it on four sides, and form its *exterior* walls, which have a circuit of 150 *li*" or 25 miles. For this number I propose to read 50 *li* or  $8\frac{1}{2}$  miles, a correction which is absolutely necessary to make the statement tally with the measurements of my survey. The following are the direct distances between the hills:—

|            |                             |              |
|------------|-----------------------------|--------------|
| 1.         | From Baibhâr to Vipula..... | 12,000 feet. |
| 2.         | „ Vipula to Ratna .....     | 4,500 „      |
| 3.         | „ Ratna to Udaya .....      | 8,500 „      |
| 4.         | „ Udaya to Sona .....       | 7,000 „      |
| 5.         | „ Sona to Baibhâr .....     | 9,000 „      |
|            |                             | <hr/>        |
| Total..... |                             | 41,000 „     |
|            |                             | <hr/>        |

This is somewhat less than eight miles, but if the ascents and descents are taken into account, the actual length will correspond very closely with the statement of Hwen Thsang when corrected to 50 *li*. The old walls forming this exterior line of rampart are still to be seen in many places. I traced them from Vipulâgiri over Ratnagiri to the Nekpai embankment, and thence onwards over Udayagiri, and across the southern outlet of the valley to Sonagiri. Across this outlet, the walls, which are still in good order, are 13 feet thick. To obtain a circuit of 25 miles, as given in Hwen Thsang's text, it would be necessary to carry these ramparts as far as Giryek on the east. As similar ramparts exist on the Giryek Hill, it is perhaps possible that Hwen Thsang intended to include it in the circuit of his outer walls. But this immense circuit would not

at all agree with his statement that "high mountains surround the city on four sides," for the distant Hill of Giryek cannot in any way be said to form one of the sides of old Rājagriha.

57. The new town of Rājagriha is said to have been built by King *Srenika*, otherwise called *Bimbisāra*, the father of *Ajātasatru*, the contemporary of Buddha. Its foundation cannot therefore be placed later than 560 B. C. according to Buddhist chronology. In Hwen Thsang's time (A. D. 629—642), the outer walls had already become ruinous, but the inner walls were still standing, and occupied a circuit of 20 *li* ( $3\frac{1}{2}$  miles). This statement corresponds tolerably well with the measurements of my survey, which make the circuit of the ramparts somewhat less than 3 miles. Buchanan calls new Rājagriha an irregular pentagon of 12,000 yards in diameter. This is clearly a misprint for 1,200 yards, which would give a circuit of 11,300 feet, or  $2\frac{1}{2}$  miles; but this was probably the interior measurement, which according to my survey is 13,000 feet. The plan of new Rājagriha I make out to be an irregular pentagon of one long side and four nearly equal sides, the whole circuit being 14,260 feet outside the ditches, or rather less than 3 miles.

58. On the south side towards the hills a portion of the interior, 2,000 feet long and 1,500 feet broad, has been cut off to form a citadel. The stone walls retaining the earthen ramparts of this work are still in good order in many places. It is possible that this work may be of later date, as suggested by Buchanan, but I am of opinion that it was simply the citadel of the new town, and that its walls have suffered less from the effects of time, owing partly to their having been more carefully and more massively built than the less important ramparts of the town, and partly to their having been occasionally repaired as a Military position by the authorities, while the repairs of the town walls were neglected as being either unnecessary or too costly.

59. The existing remains at Rājagriha are not numerous. The place has been occupied at different times by Musalmāns and Brahmans, by whom the Buddhist stupas and vihārs were pulled down to furnish materials for tombs, masjids, and temples. All the eminences that must once have been crowned by objects of Buddhist worship are now covered with Muhammadan graves; and all the Brahmanical temples about the hot springs have been constructed

with the large bricks of Buddhist stupas. One of these last monuments can still be traced outside the south-west corner of the town in a large circular hollow mound, which attracted the notice of both Buchanan and Kittoe. I examined this mound carefully, and I was satisfied that the hollow represented the original site of a stupa from which the bricks had been carried off, while the surrounding circular mound represented the mass of earth and broken brick rubbish left by the workmen. The excavated stupa at Sârnâth, near Benares, now offers almost exactly the same appearance. According to Hwen Thsang's account, this circular hollow was the site of a stupa 60 feet in height, which was built by Asoka. Beside it there was a stone pillar, 50 feet high, on which was inscribed the history of the foundation of the stupa. The pillar was surmounted by an Elephant.

60. On Mount Baibhâr there are five modern Jain temples, besides the ruins of an old Saiva temple, of which 4 granite pillars, 10 feet in height, are still standing, and 50 or 60 smaller pillars are lying confusedly about. At the southern foot of the mountain the rock has a natural scarp for about 100 yards in length, which at the western end has been smoothed to a height of 19 feet, in front of which the rock has been cut away to form a level terrace 90 feet in length by upwards of 30 feet in breadth. Two caves have been excavated out of the solid rock behind; that to the west, now called the Son Bhândâr, or "Treasury of gold," being 34 feet long by 17 feet broad, and that to the east perhaps somewhat less in length, but of the same breadth. This cave has either fallen in naturally through the decay of the rock, or, which is more probable, was blown up by a Zemindar in search of treasure, as related by Major Kittoe of the other cave.

61. The Son Bhândâr Cave has one door and one window. Inside there are no traces of seats, or of pedestals of statues, and the walls and roof are quite bare, excepting where a few scarcely legible inscriptions have been cut. There are several short inscriptions on the jambs of the doorway, as well as on the outside. In the principal inscription, which is in two lines outside, the author speaks of this cave as the "auspicious cave," evidently alluding to the fact of the first Buddhist Synod having been held in a temporary building erected in front of it by *Ajâtasatru*, Raja of Magadha. This

inscription, which is not later than A. D. 200, and is perhaps earlier, records that a certain "Muni named Vaira Deva, of powerful dignity, was able to obtain emancipation, having shut himself up for spiritual enjoyment in this auspicious cell, a retired abode of Arhantas, fitted for an ascetic for the attainment of liberation." On the east jamb of the door also the same epithet is applied to this cave, as if it was a well known name for it. As the scene of the first Buddhist Synod, it was an object of reverence to every pious follower of Buddha. It was accordingly visited by both of the Chinese pilgrims, whose records enable us to identify beyond any possibility the present Son Bhândâr Cave as the famous Satapanni Cave of the Buddhists.

62. In the centre of the valley between the five hills, and in the very midst of the old city of Rājagriha, there is a ruined brick mound 19 feet 8 inches in height, which my excavations proved to be an ancient stupa. A diminutive Jain temple, called Maniâr Math, stands on the top of the mound. It was built in A. D. 1780. As I expected to find a solid brick building, I sank a shaft outside the Maniâr Math with the intention of inclining gradually towards the centre; but I soon found that the core of the mound was a mere mass of rubbish, filling a well 10 feet in diameter. This rubbish was so loose that its removal was dangerous; but by propping up the portion immediately below the little temple, and removing the bricks cautiously, I was enabled to get down to a depth of  $21\frac{1}{2}$  feet. At 19 feet I found three small figures. One of them represents Mâyâ lying on a couch in the lower compartment, and the ascetic Buddha and two attendants above. The second is a naked standing figure with a seven-headed snake forming a canopy over the head. This is clearly not a Buddhist, but a Jain sculpture. The third is so excessively rude that it is difficult to identify it. The figure is four-armed, and is seated upon a recumbent animal, which looks more like a bull than any thing else. It probably therefore represents Mahadeva and his bull Nanda. As all three figures formed only a part of the rubbish, it seems to me certain that the well must once have been empty; and further, that the rubbish was most probably thrown in when the little Jain temple was about to be built.

63. The natives of the place call this well the treasury, and they assert that it has never been opened. On my arrival I found a Punjab Sepoy, with a servant, making an excavation on his own

account. He had sunk a shaft 3 feet in diameter at  $7\frac{1}{2}$  feet from the little temple. The shaft was then 17 feet deep. I examined the bricks which had been taken out, and on finding some with bevelled and rounded edges, and others thickly coated with plaster, I guessed at once that the original structure had been covered with an outer wall, and that the shaft had been sunk just outside the original work. To ascertain whether this conclusion was correct, I laid bare the top of the mound, and soon discovered that the well was surrounded by a wall only 6 feet in thickness. This would give the original stupa a diameter of 22 feet. The Punjab Sepoy continued his shaft down to the stone foundation without finding any thing, and then gave up the work.

64. Having observed that the slope of the mound on the north side was very gentle, I thought it probable that the building must have been approached on this side by a flight of steps. I therefore made an excavation in a line due north from the centre of the mound, and within a couple of hours I found a doorway. Continuing the excavation to the east and west as well as to the north, I found a small room with brick walls and granite pillars containing two middle sized sculptured slabs of middle age. Outside the doorway a flight of steps led downwards towards the north; I therefore turned to the south and continued my excavation until I reached the main building. On examining the wall I found three recesses, the middle one being roofed by overlapping bricks. On clearing out the rubbish, this opening proved to be a carefully built passage only 2 feet 2 inches wide, and 3 feet  $4\frac{1}{2}$  inches in height, right through the outer wall of the building. Behind it, but a few inches out of line, there was a similar passage through the original wall, only 2 feet in width. At the end of the passage I found the well filled with the same rubbish as on the south side.

65. The discovery of this passage shows that the Buddhist Monks had easy access to the interior of the building. I conclude therefore that it must originally have contained some relic that was occasionally shown to visitors and to the public generally on certain fixed days. I cannot, however, discover in the accounts of Fa-Hian and Hwen Thsang any mention of a stupa inside the walls of old Rājagriha.

66. The hot springs of Rājagriha are found on both banks of the Sarsuti rivulet; one-half of them at the eastern foot of Mount

Baibhâr, and the other half at the western foot of Mount Vipula. The former are named as follows: 1.—Ganga-Jamna; 2.—Anant Rikhi; 3.—Sapt Rikhi; 4.—Bhahm-kûnd; 5.—Kasyapa Rikhi; 6.—Byâs-kûnd; and 7.—Markand-kund. The hottest of these are the springs of the Sapt Rikhi. The hot springs of Mount Vipula are named as follows: 1.—Sita-kûnd; 2.—Suraj-kûnd; 3.—Ganes-kûnd; 4.—Chandrama-kûnd; 5.—Râm-kûnd; and 6.—Sringgi-Rikhi-kûnd. The last spring has been appropriated by the Musalmâns, by whom it is called Makhdum-kund, after a celebrated Saint named Chilla Shâh whose tomb is close to the spring. It is said that Chilla was originally called Chilwa, and, that he was an Ahîr. He must therefore have been a converted Hindu.

#### VIII.—BARAGAON.

67. Due north from Râjgîr and 7 miles distant lies the village of Baragaon, which is quite surrounded by ancient tanks and ruined mounds, and which possesses finer and more numerous specimens of sculpture than any other place that I have visited. The ruins at Baragaon are so immense that Dr. Buchanan was convinced it must have been the usual residence of the King; and he was informed by a Jain priest at Bihâr, that it was the residence of Raja Srenika and his ancestors. By the Brahmans these ruins are said to be the ruins of *Kundilpur*, a city famed as the birth-place of Rûkmini, one of the wives of Krishna. But as Rûkmini was the daughter of Raja Bhishma, of Vidarbha, or Berâr, it seems probable that the Brahmans have mistaken Berâr, for Bihar, which is only 7 miles distant from Baragaon. I therefore doubt the truth of this Brahmanical tradition, more especially as I can show beyond all doubt that the remains at Baragaon are the ruins of Nâlanda, the most famous seat of Buddhist learning in all India.

68. Fa-Hian places the hamlet of Nalo at one *yojan*, or 7 miles from the Hill of the Isolated Rock, that is, from Giryek, and also the same distance from new Râjagriha. This account agrees exactly with the position of Baragaon, with respect to Giryek and Râjgîr. In the Pali annals of Ceylon also Nâlanda is stated to be one *yojan* distant from Râjagriha. Again Hwen Thsang describes Nâlanda as being 7 *yojans*, or 49 miles, distant from the holy Pipal tree at Buddha Gaya, which is correct if measured by the road, the direct distance measured on the map being 40 miles. He also describes

it as being about 30 *li* (or five miles) to the north of new Rājagriha. This distance and direction also correspond with the position of Baragaon if the distance be measured from the most northerly point of the old ramparts. Lastly, in two inscriptions, which I discovered on the spot, the place itself is called Nālanda. This evidence seems conclusive; but I may add further that the existing ruins, which I am now about to describe, correspond most minutely with the descriptions of Hwen Thsang.

69. Fa-Hian calls Nālanda the birth-place of Sāriputra, who was the right hand disciple of Buddha; but this statement is not quite correct, as we learn from the more detailed account of Hwen Thsang that Sāriputra was born at *Kalapināka*, about half-way between *Nālanda* and *Indra-Sila-Guha*, or about 4 miles to the south-east of the former place. Nālanda has also been called the birth-place of Mahā Mogalāna, who was the left hand disciple of Buddha; but this is not quite correct, as the great Mogalāna, according to Hwen Thsang, was born at *Kulika*, 8 or 9 *li* (less than 1½ mile) to the south-west of Nālanda. This place I was able to identify with a ruined mound near Jagdispur, at 1¼ mile to the south-west of the ruins of Baragaon.

70. The mound of Jagdispur is 200 feet square, and of little height, except in the south-east corner, where there is a considerable eminence, 70 feet square. On the southern edge of this height there is a magnificent Nîm tree, under which several statues have been collected. One of these is the finest and largest piece of sculpture that I have met with. It is a figure of the ascetic Buddha, seated under the Bodhi tree at Buddha Gaya, and surrounded by horrible demons and alluring females who are seeking by different means to distract him. On each side other scenes of his life are represented, and over all, his *Nirvāṇa*, or death. A large drawing of this elaborate piece of sculpture is given in Buchanan's Eastern India, Plate XIII. vol I. The slab is 15 feet high and 9½ feet broad; and considering the excellence of the sculpture, the multiplicity of the details, and the fine state of preservation, this work is in every way worthy of being preserved by photography. The figure is called Rukmini by the ignorant villagers, who daily smear its forehead and nose with red lead, and pour milk over the mouth. The offering of milk is considered very efficacious; but the most acceptable offering is a

goat ; and at the time of my visit, the ground was still wet with the blood of a recently killed goat.

71. The remains at Baragaon consist of numerous masses of brick ruins, amongst which the most conspicuous is a row of lofty conical mounds running north and south. These high mounds are the remains of gigantic temples attached to the famous monastery of Nālanda. The great monastery itself can be readily traced by the square patches of cultivation, amongst a long mass of brick ruins, 1,600 feet by 400 feet. These open spaces show the positions of the court-yards of the six smaller monasteries which are described by Hwen Thsang as being situated within one enclosure forming altogether eight courts. Five of the six monasteries were built by five consecutive princes of the same family, and the sixth by their successor, who is called King of Central India. No dates are given ; but from the total silence of Fa-Hian regarding any of the magnificent buildings at Nālanda, which are so minutely described by Hwen Thsang, I infer that they must have been built after A. D. 415. Fa-Hian simply states that he came to the hamlet of Nalo, "where Sâriputra was born," and this is all that he says of Nālanda. But surely if the lofty temple of King Bālāditya, which was 300 feet in height, had then existed, it seems scarcely possible that he should not have noticed it. I would therefore assign the probable date of the temples and monasteries of Nālanda to the two centuries between the visits of Fa-Hian and Hwen Thsang, or from A. D. 425 to 625. This date is further borne out by the fact recorded by Hwen Thsang that the great temple of Bālāditya was similar to that near the sacred Pipal tree and Buddha Gaya. Now as similarity of style may generally be taken as denoting proximity of date, the erection of Bālāditya's temple at Nālanda may, with great probability, be assigned to the same century in which the Buddha Gaya temple was built. As I have already shown this to be about A. D. 500, the date of the Nālanda temple will lie between A. D. 450 and 550.

72. Several inscribed stones lie scattered over the ruins of Bālāditya's monastery. The letters are only mason's marks, but their forms are those of the 6th and 7th centuries.

73. As it is an object of much importance in early Indian history to fix even a single date with something like precision, I may add that Hwen Thsang makes Bālāditya a contemporary of Mihirakula of



Kashmir. Now I possess several copper coins of Mihirakula, as well as of Hiranyakula and Gokarna, all of which are certainly of later date than Mr. Bayley's gold coin of Pravarasena, and the well known copper dinars of Toramāna of Kashmir. In fact the coins of Gokarna appear to be but little earlier than those of the Karkota dynasty, which dates from A. D. 625. The date of Mihirakula and of his contemporary Bālāditya may therefore be assumed at between A. D. 500 and 550.

74. I may further mention that we possess gold coins of a Bālāditya, who in all probability is the same as Hwen Thsang's King of Nālanda. His coins, which have been chiefly discovered in the districts of Patna and Benares, are similar in type execution to the two Hindu gold coins found by Masson in one of the Hidda Topes in company with gold coins of Theodosius, Marcian, and Leo. As the last of these princes died in A. D. 474, the Hindu coins may be assigned with great probability to the following century.

75. To the south of the monastery there was a tank in which the dragon, or Nāga, Nālanda was said to dwell, and the place was named after him Nālanda. There is still existing immediately to the south of the ruined monastery a small tank called *Kargidya Pokhar*, which answers exactly to the position of the Nālanda tank, and is, I have no doubt, the identical pool of the Nāga.

76. As the people have no particular names for the different masses of ruin, but simply call them collectively "the mounds," I will, for convenience of description, name each of the principal masses after the ancient tank on its western side. Other mounds will be described with reference to their relative positions with respect to the principal ruins. In my survey of the ruins, I have also attached a letter of the alphabet to each separate mound.

77. Hwen Thsang begins his account with a *vihār*, or temple, just outside the western wall of the monastery, which had been erected on a spot where Buddha had dwelt for three months explaining the sublime law for the benefit of the gods. This temple I would identify with the ruined mound marked A, still 53 feet in height, and from 65 to 70 feet in thickness near the top, and which is situated immediately to the westward of the ruined monastery. It stands to the east of the Pūnwa tank, and may therefore be called the Pūnwa mound. My excavations, which were carried down to a depth of 17 feet, exposed the straight walls of a temple.

78. To the south, at 100 paces, there was a small stupa, erected over a spot where a pious mendicant, from a far country, had performed the *pañchāṅga*, or reverence of the five members (namely head, hands, and knees) in honour of Buddha. This stupa is well represented by a small mound marked B, which is due south of the Pānwa Mound.

79. Still further to the south there was a statue of Avalokiteswara. As this statue must have had some kind of covering as a shelter from the weather, I believe that it is represented by another small ruined mound, marked C, immediately to the south of the last.

80. To the south of the statue there was a stupa, containing the hair and nails of Buddha. Sick people recovered their health by making the circuit of this monument. Another mound, marked D, to the east of the Rahela tank, corresponds with the position of this stupa exactly, as it is due south of the last mound, C. It is still 20 feet high. I made an excavation in the top which showed that the mound had been opened previously, as I found nothing but loose rubbish. The solid brick-work on all sides, however, satisfied me that it was the ruin of an ancient stupa.

81. Outside the western wall of the monastery, and close to a tank, there was another stupa, erected on the spot where Buddha had been questioned by a heretic on the subject of life and death. A small mound, marked E, on the east bank of the *Balen* tank, corresponds exactly with the position of this stupa.

82. At a short distance to the east there was a lofty vihār, 200 feet in height, where Buddha had explained the law for four months. In the position here indicated, there stands the highest and largest of all the mounds, marked F. It is still 60 feet in height, with a diameter of 70 feet at 50 feet above the ground, and of 80 feet at 35 feet above the ground. As the outer edges of the walls are much broken, the original size of this massive building at the ground level cannot have been much less than 90 feet square. To ascertain its probable height, we may compare it with the Great Temple at Buddha Gaya, which has a base of 50 feet square, and a height of 160 feet. But as the copper gilt *amalaka* fruit, which once surmounted it, no longer exists, the original height cannot have been less than 170 feet. Now taking the same proportions for the Nālanda temple, we may deduce the height by simple rule of three, thus as 50 : 170 ::

90 : 306 feet. It is true that Hwen Thsang states the height at only 200 feet, but there is a discrepancy in his statements of the height of another Nâlanda temple, which leads me to propose correcting the height of that now under discussion to 300 feet. In speaking of the Great Temple erected by Bâladitya, Hwen Thsang in one place makes it 200 feet high, (Julien, Vol. I. page 160,) and in another place 300 feet high, (Julien, Vol. III. page 50). In both accounts the enshrined statue is said to be of Buddha himself, as he appeared under the Bodhi tree, and as the other large temple also contained a statue of Buddha, it seems highly probable that there has been some confusion between the accounts of the two temples.

83. I am quite satisfied that the lofty mound, marked F, is the ruin of a temple, for I discovered three horizontal air holes, each in the form of a cross, at a height of 35 feet above the ground. They measured respectively 6,  $8\frac{1}{2}$ , and  $11\frac{1}{2}$  feet in length. The last measurement, coupled with the broken state of the brick-work, shows that the walls must have been upwards of 12 feet in thickness. In fact on the east side, at 50 feet above the ground, the broken wall is still 15 feet thick. Most probably the walls were not less than 20 feet thick at this height, which would leave an interior chamber 30 feet square. There is now a great hollow in the centre of this mound, which I would recommend to be further excavated down to the ground level, as I think it highly probable that both statues and inscriptions of much interest would be discovered. Perhaps the colossal statue of Buddha the teacher, now standing at the foot of mound H, may have been originally enshrined in this temple.

84. In the north-east corner of the square terrace that surrounds this massive ruin, I found the remains of several small stupas, in dark blue stone of various sizes, from 10 to 30 feet in height. The ornamental carvings are still in good order, many of them being very elaborate. Rows after rows of Buddhas of all sizes are the most favourite decoration. The solid hemispherical domes are from 1 foot to 4 feet in diameter. The basement and body of each stupa were built of separate stones, which were numbered for the guidance of the builders, and cramped together with iron to secure greater durability. No amount of time, and not even an earthquake, could have destroyed these small buildings. Their solid walls of iron-bound stones could only have yielded to the destructive fury of malignant Brahmins. 1

..  
 tried to complete a single stupa, but I soon found that several pieces were missing. I believe, however, that a complete one might be obtained by a careful search about the village temples, around the Jain temple, and in the small court-yard opposite Mitrajit's house. If one could be obtained complete, or nearly so, it would form a most striking and ornamental addition to the Calcutta Museum.

85. A short distance to the north of the Great Vihâr, there was another temple containing a statue of the Bodhisatwa *Avalokiteswara*. This Saint is the same as the *Padma-pâni* of the Tibetans, and is always represented with a lotus in his hand. An extensive low mound, marked G, immediately to the north of the great mound, corresponds exactly with the situation of this temple.

86. To the north of the last temple there was a grand vihar, built by Bâlâditya, containing a statue of the ascetic Buddha. The height, as I have already noticed, is differently stated by Hwen Thsang at 200 and at 300 feet. The lesser height I believe to be the correct one, more especially as Hwen Thsang mentions that in its magnificence, its *size*, and its statue of Buddha, it resembled the Great Temple at Buddha Gaya. As this last was 170 feet in height, Bâlâditya's Vihâr might very fairly be said to resemble it in *size*, if it was 200 feet high; but if it was 300 feet in height, there could have been no resemblance whatever in the dimensions of a temple that was nearly twice as lofty. A mound, marked H, to the east of the Dehar tank, corresponds exactly with the situation of this temple. It is still 45 feet in height, with a breadth of 50 feet at top from edge to edge of brick-work. As the facing has disappeared on all sides, the original breadth, at the ground level, could not have been less than 60 feet; and if the relative proportions were the same as those of the Buddha Gaya Temple, the height of this temple must have been 204 feet, or say, in round numbers, 200 feet, exactly as stated by Hwen Thsang. There is a colossal statue of the ascetic Buddha in a small court-yard called Baithak Bhairav, at the foot of this mound, which, in all probability, was the original statue enshrined in Bâlâditya's Vihâr.

87. Four other buildings and statues, which I have been unable to identify, are next mentioned by Hwen Thsang, who then goes on to describe a brick vihar containing a very lofty copper statue of Tara Bodhisatwa. This was situated at 2 or 3 *li* to the north of the monastery, that is, between one-third and one-half of a mile. Now,

at a distance of 2,000 feet to the north of the monastery, and to the east of the Suraj Pokhar, there is a brick ruin of a very large temple, marked N. From its close proximity to the village, this ruin has supplied materials for all the existing houses, and is consequently of much smaller dimensions than those which have been already described. But the removal of the bricks has exposed the actual walls of the temple in several places; and, by making a few excavations, I was able to determine the exact dimensions of the base of this temple. It was  $70\frac{1}{2}$  feet by 67 feet, and it stood on a raised terrace, 6 feet in height and 125 feet square. If the relative proportion of base to height was the same as that of the Buddha Gaya Temple, the height of this temple could not have been less than 228 or 240 feet, according to which side of the base is taken for the calculation.

88. Hwen Thsang also mentions a large well which was just within the gateway on the south side of the surrounding walls of this vihâr. Now there is a large well, marked P, immediately on the south side of the ruined mound above described, which must be the very one noticed by Hwen Thsang as having owed its origin to Buddha himself.

89. There are many other objects worthy of notice at Baragaon, which I can only briefly enumerate: 1st, the sculptures collected in the enclosure at Baithak Bhairav, marked M; 2nd, the colossal figure of the ascetic Buddha at S. This statue is remarkable for having the names of the attendant figures inscribed over their heads. Thus we have *Arya Sâriputra* and *Arya Maudgalâdyana* inscribed over two flying figures carrying garlands; and *Arya Mitreyanâtha* and *Arya Vasumitra* over two attendant standing figures. An inscription in two lines on the back rail of the seat gives the usual Buddhist formula, and adds that the statue was "the pious gift of *Ganggakâ* (a lady who had attained the religious rank of) *paramopâsikâ*." This statue is well worthy of being photographed. 3rd, a small temple, marked T, with a figure of the three-headed goddess *Vajrâ-Varâhi*. The Buddhist formula is inscribed on this figure, which is evidently one of those mistaken by Major Kittoe for Durga slaying the buffalo demon Maheshasur. The goddess has one porcine head, and there are seven hogs represented on the pedestal. 4th, a life-size ascetic Buddha in the village of Baragaon, and a number of smaller figures at an adjacent Hindu temple, and also at the house of Mitrajit Zemindar

5th, two low mounds to the north of the village, marked V, one having a four-armed image of Vishnu on Garud, and the other having two figures of Buddha seated on chairs. The former must clearly have belonged to a Brahmanical temple. 6th, three statues at W., near the Târ Sing tank, of which two are females and one a male figure seated with hands on knees. 7th, the small temple in the hamlet of Kapatiya, marked X, where there are several interesting figures collected. Amongst them there is a fine Vajra Varâhi, and a very good Vâgiswari, with an important inscription in two lines, which gives the name of the place Nâlanda, and is dated in the year 1 of the reign of the paramount sovereign Sri Gopâla Deva. 8th, a large mound at Y, which looked like a ruined stupa. I sank a shaft, 20 feet deep, in the centre of the mound, and found that it was filled with rubbish. If therefore it was a stupa, it had been opened long before; but I am inclined to believe that it was a temple, as a large stone was found in the excavation at a depth of 13 feet. 9th, a Jain temple at Z, which is only remarkable as being of the same style of architecture as the Great Temple at Buddha Gaya. It is probably of about the same age, or A. D. 500. Its present height is only 36 feet without the pinnacle, which is modern. The whole is whitewashed. Inside the temple there are several Jain figures, of which that of *Mahâvir* bears the date of Samvat 1504, or A. D. 1417. 10th, on the banks of the Suraj-kûnd many interesting figures are collected. They are chiefly Buddhist, but there are also some figures of Vishnu four-armed, of the Varâha Avatâr, of Siva and Pâvati, and also of Surya himself.

90. I cannot close this account of the ancient Nâlanda without mentioning the noble tanks which surround the ruins on all sides. To the north-east are the Gidi Pokhar and the Pansokar Pokhar, each nearly a mile in length; while to the south there is the Indra Pokhar, which is nearly half a mile in length. The remaining tanks are much smaller in size, and do not require any special notice.

#### IX.—BIHAR.

91. The old city of Bihâr lies 7 miles to the north-east of Baragaon. In our maps the name is spelt *Behar*, but by the people it is written *Bihar*, which is sufficient to show that it must once have been the site of some famous Buddhist Vihâr. But the only existing Buddhist remains that I could find were votive stupas and fragments of figures.

One of the last was inscribed with characters of about A. D. 900, but the inscription is unfortunately only a fragment.

92. The city of Bihâr consists principally of one long narrow street, paved with rough stones. There are two bridges with pointed arches over some irrigation canals, the remains of former prosperity ; but the whole place is now dirty and decayed. In all directions are seen Musalman tombs ; the smaller ones of brick, the larger ones of squared and carved stones from the usual Muhammedan quarries of ruined Buddhist or Brahmanical buildings. To the north-west of the city there is a long isolated hill, having a precipitously steep cliff on its northern face, and on the southern face an easy slope in successive ledges of rock. The hill is now crowned by some Musalman buildings, of which the largest is said to be the tomb of Malik Bayâ, but I believe that it is the tomb of one Ibrahim in the reign of Feroze, as I read both of these names in one of the inscriptions. To the north-east of these tombs, and distant 1,000 feet, on the highest point of the hill, there is a square platform of brick, which must once have been the basement of a building, perhaps of a stupa, while the more genial site of the Durgâ, where fine trees are now growing, might once have held a Buddhist Vihâr, and its attendant monastery.

92a. One mile due east from the Durgâ, and about 100 yards inside the northern gate of the old fort of Bihar, there lies a sand-stone pillar which bears two separate inscriptions of the Gupta dynasty. Unfortunately the surface of the stone has peeled off considerably, so that both of the inscriptions are incomplete. The upper inscription, which is of Kumâra Gupta, has lost both ends of every line, being probably about one-third of the whole. The lower inscription has lost only the left upper corner, and some unknown amount at the bottom, where the pillar is broken off. But as the remaining portion of the upper part is letter for letter the same as the opening of the Bhitari pillar inscription, nearly the whole of the missing part of the left upper corner can be restored at once. This record belongs to Skanda Gupta, the son and successor of Kumâra Gupta.

93. Outside the northern gate of the old fort, there are some tombs that are said to belong to Christians, as they lie east and west, whilst all Musalman tombs lie north and south. One of them bears an inscription surmounted by a cross, which proves it to be a Christian

tomb. The inscription I believe to be in the Armenian character ; but though it does not appear to be old, probably not more than fifty or a hundred years, yet I could not obtain any information regarding the tombs.

94. The cyclopean walls of the old fort are very curious ; but as the fort has been fully described by Buchanan, it is unnecessary for me to do more than make this mention of it.

#### X.—GHOSRÁWÁ.

95. A Buddhistical inscription from Ghosráwá, a village to the S. S. W. of Bihar, distant 7 miles, was first discovered by Major Kittoe, who published a translation of it made by Dr. Ballantyne, in the *Journal of the Asiatic Society of Bengal*, Vol. XVII. Part I. p. 492. This inscription is a very important one for the illustration of the later history of Buddhism, as it mentions the existence, somewhere about the 8th or 9th century, of several of the most famous places of the Buddhists. For instance, it mentions, 1st, the Kanishka monastery in the City of Nagarahára, close to Jelalabad in the Kabul valley ; 2nd, the *Vajrásan*, or Diamond throne of Buddha, at Buddha Gaya ; 3rd, the *Indra-Sila* peak, which I have already identified with Giryek ; 4th, the Vihar in Nálanda, the city of Yaso Varmma. This part of the translation, however, requires revision, as the name of Nálanda, which occurs twice, has in both instances been rendered as if it was merely a term for some ascetic posture, instead of the proper name of the town which contained the most famous monastery in all India. I will submit this inscription for retranslation.

96. The other remains at Ghosráwá are few and unimportant. There is a mound of brick ruin touching the village, and a small temple on a low mound with some broken figures between Ghosráwá and the small village of Asánagar. The inscription obtained by Major Kittoe is now fixed in the wall of this temple. At the western foot of the Ghosráwá mound there is a four-armed standing male statue of life size, inscribed with the usual formula of the Buddhist faith. In the upper right hand there is a necklace, but the lower hand is open, the upper left hand holds a lotus, and the lower hand a bell. There is a small figure of Buddha in the head dress of the statue, from which I believe that this figure represents Avalokiteswara, as Hwen Thsang describes a similar statue at the Kapotika Sangharáma. The characters of the inscription do not seem to me to be later than A. D. 800.



97. On the top of the mound I found the lower portion of a female figure, of which the upper part was fixed in the ground near the A'sánagar temple. The statue is two-armed, and holds a lotus in one hand. It probably represents Dharmma. There are two four-armed female attendants, that to the left carrying a human head.

#### XI.—TITARÁWA.

98. At Titaráwa, 2 miles to the north of Ghosráwá, there is a fine large tank, 1,200 feet in length, with a considerable mound of brick ruin to the north, and a colossal statue of the ascetic Buddha to the south, which is now called Bhairav. The pedestal is 7 feet broad, and the whole figure is still 9 feet high, although the upper portion is wanting. The usual Buddhist formula is inscribed on the lotus leaves of the pedestal. There are besides several others small and unimportant, one of which bears the Buddhist formula, and another inscription in three lines of small letters. The greater portion of this inscription is injured, but sufficient remains to declare the date of the statue, which I believe to be about A. D. 800; I can read the name of Mahápála at the end of it. On the west side of the statue there is the foundation of a brick stupa, 18 feet in diameter.

99. The mound of Titaráwa is about 20 feet high, and has a small modern fort on the top, with a round tower at each of the angles. Excavations for bricks are still going on, as at the period of Major Kittoe's visit. I traced the remains of several walls, from which I infer that the mound was the site of a large monastery. There is no mention of this place either in Fa-Hian or Hwen Thsang.

#### XII.—APHSAR.

100. Five miles to the east of Ghosrawa, and on the eastern bank of the Sakri river, there is a low hill covered with brick ruins, close to a village called Apsar. The long and important inscription of a second dynasty of Guptas, that was discovered at this place by Major Kittoe, is no longer to be found at Apsar. The people are unanimous in stating that Major Kittoe removed it to Nowáda for the purpose of copying it; and he himself states that he "brought it away to re-examine it, and to restore it as much as possible before having it fixed in a pedestal near the Varáha" in Apsar. I inquired for this inscription at Nowáda, at Gaya, and at Benares, but could not hear any thing of it. The loss of this

important inscription is very much to be regretted; but luckily I possess a transcript of it in modern Nagari, which Major Kittoe himself gave me in 1850. This is now being translated by Babu Rajendralal Mitra.

### XIII.—BARABAR.

101. At 16 miles to the north of Gaya, or 19 miles by the road, there are several groups of granite hills, called *Kauwa-Dol*, *Barábar*, *Nágárajuni*, and *Dharáwat*. All of these possess some Buddhistic remains, but the most interesting are the caves of *Barábar* and *Nágárajuni*, which were hewn out of the solid rock upwards of two thousand years ago.

102. *Kauwa-Dol* is a detached hill nearly one mile to the south-west of the main group of hills, and just six miles to the east north-east of the Belah Dak bungalow. This hill is quite inaccessible, as it is formed entirely of huge masses of granite piled precipitously above one another, and crowned with a single lofty block that frowns grandly over the plains below. It is said that this pinnacle was formerly topped by another block, which was so nicely balanced that it used to rock even when a crow alighted upon it. From this belief the hill acquired the name of *Kauwa-Dol*, or the "crows' swing."

103. At the northern foot of the *Kauwa-Dol* there has formerly been a temple of hewn granite. A large village must also once have existed on the north and east sides of the hill, as the foot of the hill, which is considerably raised above the fields, is strewn with broken bricks, hewn stones, and fragments of pottery. There are several Muhammedan tombs on this mound, built chiefly of pillars and other squared and ornamented stones of some Hindu temple. The name of this old place is said to have been *Samanpur*. Major Kittoe, however, was told that this name applied only to the northern portion of the ruins, the eastern portion being called *Sarain*.

104. On the rocks of the northern face of the hill, numerous rude figures have been sculptured. One of these is a figure of Ganes, 2½ feet high, beside a lingam. Several of them represent *Gauri-Sankar* or *Hara-Gauri*; but the most common of these sculptures is the favourite figure of the four-armed Durga slaying the *Mahesásur*, or Buffalo demon. In her two right hands she holds a sword and a trident, and in her upper left hand a shield, while her lower left hand grasps the tail of the buffalo. All of these are Brah-

manical figurers; but there are also rude figures of Buddha seated, and one female figure which is said to be *Padmavati*, or *Maya Devi*, but which is most probably only a representation of *Dharmma*. In a recess on the east side of the hill, and amidst the ruins of a large temple, of which several pillars are still standing, there is a colossal figure of Buddha the ascetic, as he appeared when seated in mental abstraction under the Bodhi tree at Buddhha Gaya. A drawing of this figure has been given in Buchanan Hamilton's *Eastern India*, Vol. I. Plate XIV. Fig. 5. It is the largest statue that I have seen, the figure alone being 8 feet high, with a breadth across the shoulders of four feet, and of six feet across the knees. But the great statue in the temple of Buddha Gaya, which was seen and described by Hwen Thsang, was somewhat more than one-third larger, its dimensions being 11 feet 5 inches in height, 8 feet 8 inches in breadth across the knees, and 6 feet 6 inches across the shoulders.

105. In the Barábar group of hills there are several distinct peaks, of which the most conspicuous are the *Murali* peak to the north, and the *Sanda-Giri* on the south, both of which join the Barábar or *Siddheswara* peak on the east. On the summit of the Barábar peak there is a small Hindu temple dedicated to Mahadeva which contains a lingam called Siddheswara, and which, from an inscription in one of the caves mentioning this name, we know to be at least as old as the 6th or 7th century. Immediately to the south of the Barábar peak, there lies a small valley, or basin, nearly square in shape, and entirely surrounded by hills, except at two points on the north-east and south-east, where walls have been built to complete the enclosure. Its greatest length, measured diagonally from peak to peak, is just half a mile, but the actual basin is not more than 400 yards in length by 250 yards in breadth.

106. Towards the southern corner of the basin, there are two small sheets of clear water which find an outlet underground to the south-east and re-appear in the sacred spring called *Pátál Gangá*, where an annual assembly is held in the month of *Bhádrapada* for the purpose of bathing. On this side is the principal entrance to the valley, which lies over large rounded masses of granite, now worn smooth and slippery by the feet of numerous pilgrims. I ascended by this path without any difficulty, after having taken off my shoes, but in descending I found a shorter and quicker way down the mass

of loose rough stones at the foot of the enclosure wall on the same side. These stones are the ruins of buildings which once crowned the wall on this side.

107. Immediately to the south of the water, and in the southern angle of the valley, there is a low ridge of granite rock lying from west to east about 500 feet long, from 100 to 120 feet thick, and from 30 to 35 feet in height. The top of the ridge is rounded, and falls rapidly towards the east. It is divided longitudinally by natural cleavage into three separate masses. The block towards the north is much the smallest, being not more than 50 feet long by 27 feet in thickness. Originally it was probably about 80 or 100 feet in length, but its eastern end has been cut away to obtain access to the face of the central mass of rock, in which the *Karna-chopâr* cave has been excavated. A lingam and two rude Brahmanical figures are sculptured on the end of the northern rock. The middle rock is between 200 and 300 feet in length, with a perpendicular face towards the north. The largest mass of rock, which faces towards the south, is rounded at top, but the lower part has been scarped to form a perpendicular wall for the two large caves now called *Sudâma* and *Lomas Rishi*. A level piece of ground, about 100 feet in width, intervenes between this great rock and the foot of the southern hill. Sheds and temporary buildings are erected on this spot during the annual fair time, when the caves are visited by thousands of pilgrims. The ground is strown with broken bricks and fragments of pottery, and the rubbish has now accumulated to a height of three feet above the floors of the caves. This will account for the fact of there having been one foot of water in these caves when visited by Buchanan. The water was drained away by Major Kittoe, who dug a trench along the foot of the rock, and brought to light several pieces of stone pillars which probably belonged to some portico or cloister in front of the caves.

108. The Barâbar Basin is naturally a strong defensive position, as it possesses plenty of water, and is only accessible at two points, on the north-east and south-east. Now both of these points have been closed by walls, and as there are also traces of walls on the surrounding hills, and more particularly on the Siddheswara Hill, it seems certain that the place must once have been used as a stronghold. There is indeed a tradition of some Raja having been besieged in this place, and that he escaped by the narrow passage over the

Siddheswara Hill. Its very name of Barâbar, that is, *bara* and *awara*, or *Barâwarâ*, the "great enclosure," points to the same conclusion, although this may have been originally applied to the much larger enclosure between the Barâbar and Nâgârjuni Hills, and the western branch of the Phalgu river, where, according to Buchanan's information, the original Ram Gaya was situated. The numerous heaps of brick and stone that lie scattered over the plain would seem to show that this had once been the site of a large town. The situation is similar to that of old Raja Griha, namely, that of a small valley or basin almost surrounded by hills; but in size it is very much less than the famous *Giriraja*, or hill-encircled city of Jarasandha. This enclosure had the Barâbar Hill on the west, the Sangar branch of the Phalgu river on the east, and the two parallel ridges of the Nâgârjuni Hills to the north and south. It was upwards of one mile in length, with a mean width of half a mile, and a circuit of rather more than three miles. The circuit of the hills surrounding old Raja Griha was about 8 miles.

109. The caves in the Barâbar Hills are usually known as the *Sat-ghara* or "seven houses." Major Kittoe proposed *sapt garbha*, or the "seven caves" as the true name; but I think that *sapta-griha*, or as it is pronounced in the vernacular of the present day, *Sat-ghara*, is a preferable etymology, as it is the very same name by which this collection of caves is now known.

110. The Nâgârjuni Hills consist of two very narrow ridges of granite running nearly parallel, and about half a mile distant from each other, between the Barâbar peak and the Phalgu river. The northern ridge would appear to be the same as that which Buchanan calls *Murali* (Eastern India, Vol. I. p. 100), but my informants applied this name to another peak in the Barâbar group. The southern ridge contains the famous old caves, of which the largest one, called the *Gopi* cave, is on the southern side, with its entrance to the south. The two other caves are situated on the southern face of a small spur, or off-shoot, on the northern side of the hill.

111. There are therefore altogether seven caves in these hills, four of which belong to the *Barâbar* or Siddheswara group, and three to the *Nâgârjuni* group. I incline therefore to believe that the name of *Sat-ghara*, or the "seven houses," belonged originally to the whole of these seven caves, and not to the four caves with seven chambers

in the Barābar group. It is true indeed that the Barābar caves are somewhat older than those of Nâgârjuni, but the difference of date is very little, being not more than 30 years, as will be shown when I come to speak of the inscriptions.

112. The *Karna Chopâr* cave is situated in the northern face of the Barābar ridge of granite which has already been described. The entrance, which is of Egyptian form, faces the north. The cave is 33 feet 6½ inches in length, by 14 feet in width. The sides of the cave are 6 feet 1½ inch in height, and the vaulted roof has a rise of 4 feet 8 inches, making the total height 10 feet 9 inches. At the western end there is a raised platform 7 feet 6 inches long, 2 feet 6 inches broad, and 1 foot 3 inches high. From its length I infer that this was the pedestal of a statue. The whole of the interior of the cave is polished. On the outside, and at the western corner of the entrance, there is a sunken tablet containing a short inscription of five lines in the ancient character of Asoka's pillars. It records the excavation of the cave in the 19th year of the reign of Raja *Piyadasi*, that is, of Asoka himself. This cave therefore dates as far back as 245 B. C. The inscription has been so much injured by the weather that it is very difficult to make out the letters satisfactorily. It also faces the north, so that no advantage can be obtained from the difference of light and shade which is caused by the sun in the hollows of the letters of such inscriptions as face in other directions. There are also several short inscriptions on the jambs of the doorway, such as *Bodhimula*, "the Root of Intelligence," *Daridra Kântâra*, "the cave of the poor," or "the mendicant's cave," and others the records of mere visitors.

113. The *Sudâma* cave is situated in the same granite ridge, but on the opposite side of it, and with its entrance facing the south. The doorway which is of Egyptian form, is sunken in a recess 6½ feet square and 2 feet deep. On the eastern wall of this recess or porch, there is an inscription of two lines in the ancient Pali characters of Asoka's pillars. An attempt has been made to obliterate the greater part of this inscription with a chisel, but owing to the great depth of the letters the work of destruction was not an easy one, and the clearly cut lines of the original letters, with the exception of one perhaps at the end, are still distinctly traceable in the midst of the rough holes made by the destroyer's chisel. This in-

scription records the dedication by Raja *Piyadasi* (that is, Asoka himself), in the 12th year of his reign of a *Nigoha* cave. The excavation of this cave therefore dates as far back as 252 B. C., the very same year in which many of Asoka's edicts were promulgated, as recorded in his different inscriptions both on pillars and rocks. The cave itself consists of two chambers, of which the inner one is nearly circular with a hemispherical domed roof. This roof, which projects beyond the wall of the circular room into the outer apartment, is considerably under-cut, as if to represent a thatch with its overhanging eaves. The circular room is 19 feet 11 inches in diameter from west to east, and 19 feet from north to south. The outer apartment is 32 feet 9 inches in length by 19 feet 6 inches in breadth. The walls are 6 feet 9 inches in height to the springing of the vaulted roof, which has a rise of 5 feet 6 inches, making the total height of the chamber 12 feet 3 inches. At the east end of this apartment there is a shallow recess which may have been intended as a niche for a statue, or more probably as an entrance to another projected chamber. But the work was abandoned soon after its commencement, and remains rough and unfinished, while all the rest of the cave, both roof and walls, is highly polished.

114. The *Lomas Rishi* cave is similar to the *Sudâma* cave, both as to the size and arrangement of its two chambers; but the whole of the interior of the circular room has been left rough, and both the floor and the roof of the outer apartment remain unfinished. The straight walls of this apartment are polished, but the outer wall of the circular room is only smoothed and not polished. The chisel marks are yet visible on the floor, while on the roof, which has only been partially hewn, the cuts of the chisels, both broad and narrow, are still sharp and distinct. The excavation of the roof would appear to have been abandoned, owing to the work having reached a deep fissure, which forms one of the natural lines of cleavage of the rock.

115. The door-way of this cave is exactly of the same size and of the same Egyptian form as that of the *Sudâma* cave, but the entrance porch has been much enlarged, and has been sculptured to represent what I believe to be the ornamental entrance of a wooden building. A tolerably faithful sketch of this entrance will be found in Buchanan (*Eastern India*, Vol. I. p. 104), but owing to the accumulation of rubbish at the time the sketch was taken, the

.. full height of the work is not shown. The inscriptions also are represented as extending below the top of the door-way on one side, which is not the case, as they are all confined to the semi-circular space above the door. This sketch, however, shows distinctly the ends of the roofing beams and the bamboo lattice work of the gable, just such as may still be seen in the wooden buildings of Burmah.

116. As the inscriptions over the door-way of this cave are all in the same character as those of the later Princes of the Gupta dynasty, the date of this sculptured façade may be assigned to the 3rd or 4th century of our era. But as the cave itself corresponds so exactly, both in size and in arrangement, with the Sudâma cave, I feel satisfied that it must have been excavated at the same time, and that, before the enlargement of the entrance porch, there must have existed an inscription of Asoka, recording the name and purpose of the cave. The present inscriptions are deeply and boldly cut, but the letters are not polished. There are two distinct inscriptions, the upper one, of two lines, being somewhat later in date than the lower one, of four lines, in rather larger letters. Both of these inscriptions have been translated by James Prinsep, (Journal 1837, p. 647,) who, owing perhaps to the misplacement of the lines of his fac-similes, did not perceive that translations of both had already been published by Wilkins in the second volume of the Asiatic Researches. There is some variation in the two versions of these inscriptions, which I will submit to Babu Rajendra Lala Mitra for retranslation.

117. The fourth cave of the Barâbar group is that which is called *Viswa Mitra* by Major Kittoe, but which was named simply *Viswajhopri*, or "Viswa's hut," by my informants. This cave is excavated in a large block of granite lying to the eastward of the cave ridge, and at a somewhat lower level. It consists of two rooms, an outer apartment or ante-chamber which is polished throughout, and an inner apartment of 11 feet in diameter, which is rough and unfinished. The former is 14 feet long by 8 feet 4 inches broad, and has an inscription on the right hand wall of four lines in the ancient Pali character of Asoka's inscriptions. The last five letters have been purposely mutilated with the chisel, but they are still quite legible. The inscription, which is otherwise perfect, records the dedication of the cave by Raja *Piyadasi* (that is, Asoka himself) in the 12th year of his reign, equivalent to 252 B. C. This is the only inscription



in this cave, which would seem to have escaped the notice of the Brahmanical occupants or visitors of the other caves. On the floor of this outer chamber there are four oblong socket holes, which would appear to have been intended for the reception of timber framing, as suggested by Major Kittoe.

118. The great cave in the Nâgârjuni hill is excavated in the southern face of the rock, at a height of 50 feet above the country. It is approached by a flight of stone steps, but the entrance is concealed partly by a tree and partly by an *Idgah* wall, which was built by the last Musalman occupants. It was inhabited when visited by Major Kittoe in 1847, but was empty when I saw it. This cave is 46 feet 5 inches long and 19 feet 2 inches broad, both ends being semi-circular. The walls are 6 feet 6 inches high, and the vaulted roof has a rise of 4 feet, making a total height of 10 feet 6 inches. The whole of the interior is polished, but quite plain. There is a low brick platform of modern date at one end, which is said to have been the seat of a Musulman saint, who was the disciple and successor of Haji *Harmâyan*. The door-way of the cave is of Egyptian form, being 2 feet 6 inches wide at top, and 2 feet 11½ inches at bottom, with a height of 6 feet and ⅓ an inch. On the eastern jamb of the door-way there is an inscription in ten lines of the same family and same date as those over the door-way of the Lomas Rishi cave. This inscription has been translated by Wilkins (*Asiatic Researches*, Vol. I. p. 282), and by James Prinsep (*Bengal Journal*, 1837, p. 672). On the western jamb of the door there is a short inscription in large letters of the 7th or 8th century, *Achârya Sri Yogananda* "the teacher Sri Yogananda," whose name will be found repeated in another cave.

119. On the outside, immediately over the door-way, there is a small sunken tablet, containing a short inscription of four lines in the ancient Pali characters of Asoka's edicts. This has been translated by James Prinsep (*Bengal Journal*, 1837, p. 677). The cave is called *Gopi-ka-kubha*, that is, the "Gopi's or Shepherdess's Cave." The inscription records that "The Gopi's cave an abode lasting as the Sun and Moon, was caused to be excavated by *Dasaratha*, beloved of the Devas, on his accession to the throne, as a hermitage for the most devoted *Bhadantas* (Buddhist ascetics)."

120. The other two caves of the Nâgârjuni group are situated

..  
 in a low rocky ridge on the northern side of the hill. To the south, and in front of the caves, there are two raised terraces. The lower one to the eastward has a well, 9 feet in diameter and 23 feet deep, immediately in front of the entrance to the eastern cave, which in the inscription is called the "*Vapiya-ka-kubha*, or Vapiya Cave," which I believe refers to the well (*vapi*) above described, and which may therefore be translated as the "well cave." The upper terrace to the westward is 120 feet long from north to south, 60 feet broad from west to east and 10 feet in height above the plain. The walls are chiefly of brick, but there are several squared stones and granite pillars near the top. These must, I think, have been added afterwards by the Muhammedans when they occupied the caves, for the platform is covered with their small tombs. All around there are heaps of bricks and fragments of carved and squared stones, which show that several buildings must once have existed in this place. The upper platform I believe to have been the site of a *vihar*, or Buddhist chapel monastery, but there is nothing now remaining to prove any Buddhist occupation, excepting only one fragment of a standing statue.

121. The *Vapiya* cave has a small porch or ante-chamber 6 feet long by  $5\frac{1}{2}$  feet broad, from which a door-way only 2 feet 10 inches wide leads to the principal room, which is 16 feet 9 inches long and 11 feet 3 inches broad. The roof is vaulted, and 10 feet 6 inches in total height. The whole of the walls are highly polished. On the left hand side of the porch there is an inscription of four lines in the old Pali characters of Asoka's edicts. In this record the cave is called, as already mentioned, the *Vapiya-ka-kubha*, or "the well cave," in evident allusion to the well in front of it. The remainder of the inscription is word for word the same as that of the Gopi's cave. There are several short inscriptions on the side walls of the porch and on the jambs of the door-way, but they are of little interest, as they merely record the names of visitors. The longest of them reads—

*Achārya Sri Yogananda pranamati Siddheswara*, "The teacher Sri Yogananda offers adoration to Siddheswara." In this inscription we find the name of the *lingam* now existing in the temple of the Barā-bar peak, recorded in characters of the 6th or 7th century. James Prinsep refers them to the 6th century. A still older inscription, *Videsa vasusya Kīrtih*, or "the renown of Vasu of Videsa," belongs

to the age of the Guptas. According to Buchanan this cave is called *Mirza Mandai*, or the "Mirza's house."

122. The third cave of the Nâgârjuni group is situated immediately to the westward of the last cave, in a gap, or natural cleft of the rock, which has probably been enlarged by art. The entrance to the cave lies in this gap facing the east. It is a mere passage, only 2 feet 10 inches in width and 6 feet  $1\frac{1}{2}$  inch in height, with a length of 7 feet 2 inches on the northern side, and of 5 feet 9 inches on the southern side. There are socket holes both above and below for the reception of a wooden door. The cave itself is 16 feet 4 inches by 4 feet 3 inches; but it has been divided into two rooms by a rude brick wall. This must have been the work of some ascetic of former days, as the only opening to the inner room appears to be too small for the passage of any grown-up man, and could only have been used by the occupant for the reception of food. On the right hand jamb of the door-way there is an inscription of four lines in the old Pali characters of Asoka's edicts, in which this cave is called the *Vadithikā-kubha*. The remainder of the record is letter for letter the same as those of the *Gopi* and *Vapiya* caves. The meaning of the name of *Vadithi* I am not able to explain. The root *Vada* means to separate or divide, to surround or encompass, and also to cover. Any one of these meanings might be appropriately applied as descriptive of the peculiar position of this cave, for it is entirely separated from the other cave, it is encompassed by the bluff rocks of the gap in which it is situated, and is so effectually covered or screened from view, that it altogether escaped the notice of Mr. Hathorne when he made copies of the inscriptions in the *Gopi* and *Vapiya* caves for James Prinsep. I think therefore that the term secluded would be descriptive of the position of the cave, and I would suggest that *Vadithika* may probably be a vernacular form of *vada* + *arthika*, the whole meaning simply the cave of the "secluded mendicants." According to Buchanan this cave is called the abode of Hâji *Harmāyan*.

123. From the foregoing account of the Barâbar caves it will be seen that the two groups are separated by date as well as by position, the *Satghara* caves having been excavated in the 12th and 19th years of Raja *Piyadasi* (or Asoka) while those of Nâgârjuni were excavated in the first year of *Dasaratha*, the beloved of the Devas.

According to the Vishnu Purâna, *Dasaratha* was the grandson of *Asoka* and the son of *Suyasas*; and as the son of *Asoka*, according to the *Vayu Purâna*, reigned only eight years, the accession of *Dasaratha* must have taken place in 214 B. C. The age of the *Nâgârjuni* caves is therefore 31 years later than that of the *Karna-chopar*, and 38 years later than that of the *Sudâma* and *Viswa* caves.

124. From the various inscriptions we learn that these caves have been successively occupied by Buddhists and by Brahmanists. They were originally excavated for the occupation of Buddhist monks by the Kings *Asoka* and *Dasaratha* in the 3rd century before Christ. About the 3rd or 4th century after Christ, the Kings *Sârdula Varmma* and *Ananta Varmma*, placed Brahmanical images of *Deva-mâtâ*, of *Kâtyâyani*, and of *Mahâdeva* and his wife in three of the caves. At a somewhat later date, in the 6th or 7th century, the teacher *Yogananda* recorded his adoration of the *Siddheswara lingam*. This occupation by Brahmins in the 7th century may account for the silence of the Chinese pilgrim *Hwen Thsang* regarding the caves, which, as being in the immediate neighbourhood of *Gaya*, would otherwise have attracted his attention. At a still later date, somewhere about the 12th century, the *Jogi-Karmamârگا* and the pilgrim *Bhayankara Nâtha* visited the caves and inscribed their names. Still later the *Nâgârjuni* caves were occupied by Musalmân Fakîrs. The *Idgâh* outside the *Gopi* cave is said to be only 150 years old, but the numerous graves on the raised terrace in front of the *Vapiya* cave would seem to denote a much longer occupation of probably not less than 300 or 400 years.

125. During this successive occupation the caves would appear to have received new names, as not one of the ancient names recorded in the inscriptions has been preserved. Indeed the most ancient names would seem to have been lost at a very early date, for the *Gopi* cave of *Dasaratha* is designated by *Ananta Varmma* as "this cavern of the *Vindhya* mountains," and the *Vadithi* cave is called simply "this cave," as if the ancient names had already been forgotten. Similarly the *Lomas Rishi* cave is called *Pravara-giri-guha*, or "the great mountain cave." From these instances I would infer that the present names of the caves are all of later date than the time of *Ananta Varmma* in the 3rd or 4th century. That they were also of Brahmanical origin seems to me to be quite certain for the following

reasons :—*Karna-chopâr* I take to be simply *Karna-jhopra*, or “Karna’s Hut,” so named after *Karna*, King of Angga, the illegitimate son of Prithâ, the mother of the Pandus. Similarly, *Lomas Rishi*, who was described to Buchanan as a “very hairy Saint,” is no doubt the same as *Loma-Pâda* or “hairy foot,” who was also one of the Kings of Angga (or Bhâgulpur). But as *Loma-Pâda* is only a descriptive appellation of a Prince whose true name was *Dasaratha*, it would seem as if the name of *Dasaratha*, the founder of the three Nâgârjuni caves, had actually been preserved down to a comparatively late period, and was then ignorantly referred by the Brahmans to the early king of Angga instead of to the Maurya Prince of Magadha. Regarding the name of *Suddma*, or *Sudhâma*, I am unable to offer any conjecture; but *Viswamitra*, was one of the most celebrated of the seven Rishis, or great Brahmanical Saints.

126. The silence of Hwen Thsang regarding the caves has been already noticed; but I have a suspicion that he had heard of the celebrated spring of the *Pâtâl Gangâ* at the foot of the Barâbar Hill. According to his account there was a famous spring of pure water situated at 80 *li* (or 5 miles) to the north of Gaya. Now as I could not hear of any spring to the northward of Gaya nearer than Barâbar, I would suggest that Hwen Thsang’s distance of 80 *li* should be corrected to 130 *li* (or 21½ miles), which would make his famous spring agree exactly with the position of the *Pâtâl Gangâ*, according to the distance by road, which is 13 miles to the Bela Dâk Bungalow + 6 to the Kauwa-Dol hill + 2 more to the Pâtâl Gangâ. Hwen Thsang adds that “the Indians following an ancient tradition called this spring the ‘holy water’ (l’eau sainte), and that at all times whoever drank of it, or bathed in it, was instantly purified from the stain of his sins.” Now the source of the Pâtâl Gangâ is still held in such esteem that, according to Buchanan, from 20,000 to 50,000 people assemble annually in the middle of the month of Bhâdrapada to bathe in its waters, and about 500 people bathe daily during the whole of that month.

127. Should this identification be correct, it would seem to be almost certain that towards the middle of the 7th century of our era, not only were these caves occupied by the Brahmans, but the very memory of their Buddhist origin had been either forgotten or was carefully concealed.

128. The *Dharâwat* group of hills lies immediately to the northward of the *Barâbar* hills, about  $1\frac{1}{2}$  mile distant. There are two distinct ridges running from west to east, that to the south being nearly 2 miles in length with three peaks named *Saleya*, *Gureya*, and *Dhaoli*. The nearest road from *Barâbar* to *Dharâwat* lies through a pass between the *Gureya* and *Dhaoli* hills. The northern ridge consists of a single hill named *Ratani*, which in former days was occupied by some establishment of the Buddhists. On the northern slope of the hill there are two brick terraces which have been built up against the rock. The eastern terrace is 60 feet long by 20 feet broad, and 50 feet above the plain. Near the top the solid brick-work can still be seen for 20 feet in height, below which the brick rubbish reaches to the foot of the hill. The second terrace lies more than 200 feet to the westward of the other; it has a front of 250 feet, but its height is not more than 15 feet above the plain. On this terrace there are two broken Buddhist figures, and beneath it there are four others, of which one bears the usual Buddhist formula of "*Ye Dhamma hetu prabhava, &c.*," in characters of the 9th or 10th century.

129. To the north of the *Ratani Hill* there is a large tank called *Chândokar Tâl*, 2,000 feet in length and 800 feet in width. On the eastern embankment there is a new temple to *Mahâdeva*, only three years old, and close beside it a very small old temple to *Narsingh*. Outside this temple there is a very fine life-size statue named *Bhairav*. The figure stands under a thick stem of lotus which forms an arch overhead, and from which little curling branches strike off on both sides, ending in lotus flowers which support tiny figures of men, women, and animals. The statue has twelve arms, and bears in the head-dress a small figure of Buddha squatted with hands in lap. I recognized it at once as a statue of the famous *Bodhisatwa Avalokiteswara*. Beside the statue there are several sculptured stones containing rows of Buddhas, and also several fragments of votive stupas, and two slabs with representations of the *Navagraha*, or "nine planets." There are also numerous fragments of sculpture under a *Pipal* tree close by, two of which bear inscriptions in characters of the 9th or 10th century.

130. To the north-east of the *Chândokar Tâl* there is an extensive mound of brick rubbish, which is probably only the remains of the

former town of Dharâwat. In the north-west corner of this mound there are two small eminences, which may be the remains of temples, but as the surface of the mound now presents nothing but small fragments of bricks, all the larger bricks having been removed to furnish materials for the present village, it is quite impossible to say what kind of buildings may once have stood upon it. All that can be inferred, I think, from the present remains, is that Dharâwat must at one time, probably about the 8th or 9th century, have been the seat of a considerable Buddhist community. Major Kit-toe paid a hurried visit to Dharâwat by moon-light. He notices the twelve-armed figure, which he calls a Buddhist sculpture, as being very remarkable.

#### XIV.—BESÂRH.

131. The village of *Besârh*, बसार्ह, is situated 27 miles a little to the east of north from Patna, and 20 miles from Hâjipur on the left bank of the Ganges. Both the distance and direction from Patna point to this place as the representative of the ancient *Vaisâli*. The name also is the same, as it is written *Besâr* by Abul Fasl in his *Ayin Akbary* (Gladwin II. 198). Now Hwen Thsang places the King's palace in Vaisâli at from 124 to 135 *li* (20 to 22 miles) to the east of north from the northern bank of the Ganges opposite Pâtaliputra, that is, from the present Hâjipur. He also describes the King's palace as being from 4 to 5 *li* (from 3,500 to 4,400 feet) in circuit, which agrees with the size of the ruined fort now called *Râja Bisâl-ka-gurh*, which is 1,580 feet long and 750 feet broad inside, or 4,660 feet in circuit round the crest of the mound. This almost perfect coincidence of name, position, and dimensions, seems quite sufficient to place the identification of Besârh with Vaisâli beyond all reasonable doubt. I will therefore now proceed to describe the objects of interest that still remain in Besârh and the neighbouring village of Bakhra, which will afford further proof of the identity of Besârh and Vaisâli.

132. These ruins were visited by Mr. J. Stephenson in 1834, and described by him in Prinsep's *Journal* for 1835, p. 128. They consist of two distinct groups, one at Besârh itself, and the other, 2 miles to the north north-west of Besârh, and 1 mile to the south-east of Bakhra. But the whole of these must have belonged to the ancient Vaisâli, as Hwen Thsang describes the old foundations of

the city, although even then much ruined, as occupying a circuit of from 60 to 70 *li* or from 10 to 12 miles. Now an oblong square,  $3\frac{1}{2}$  miles from north to south, and  $2\frac{1}{2}$  miles from west to east, making a circuit of exactly 12 miles, would include both Bakhra and Besârh and all the remains that are at present traceable. This of itself would be sufficient to show that the Bakhra ruins must have formed part of the ancient Vaisâli; but the fact will be placed beyond all doubt when I come to describe the ruins themselves, which correspond in the most remarkable manner with the minute details recorded by Hwen Thsang.

133. The remains at Besârh consist of a large deserted fort, and a ruined brick stupa. The fort is a large brick covered mound of earth, 1,580 feet long from north to south and 750 feet broad from west to east measured from edge to edge. It has round towers at the four corners, and the whole is surrounded by a ditch which was full of water at the time of my visit. The ruined ramparts along the edge, and the four towers at the corners, are somewhat higher than the mass of the mound, which has a general elevation of from 6 to 8 feet above the country. The height of the north-west bastion I found by measurement to be 12 feet above the fields, and 15 feet above the bottom of the ditch, where it is dry. The main entrance was in the middle of the south face, where there still exists a broad embankment across the ditch as well as a passage through the rampart. In the northern face there was probably only a postern gate, as there is no passage through the rampart, and no trace of any embankment across the ditch, excepting the fact that the only dry part of the ditch is on this face. The only building within the fort is a small brick temple of modern date.

134. Outside the south-west angle of the fort, and about 1,000 feet distant, there is a ruined mound of solid brickwork, 23 feet 8 inches in height above the fields. The whole of the top has been levelled for the reception of Musalman tombs, of which the largest ascribed to Mîr Abdâl, is said to be 500 years old. Mr. Stephenson gives the name of the saint as Mîr Abdullah, and the age of the tomb as 250 years. My informant was the Musalman whom I found in charge of the tomb. On the south edge of the mound there is a magnificent wide-spreading Banian tree, supported on numerous trunks, which shades the whole of the tombs. On the same side also

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a flight of steps leads down to the village of Besârh. This brick mound is the ruin of one of the *stupas*, or solid towers of Vaisâli, of which so many are described by Hwen Thsang. "Both within and without and all round the town of Vaisâli," says he, "the sacred monuments are so many that it would be difficult to enumerate them." He has however described a few of them, which were situated to the south of the town, one of which I have no doubt is the solid brick mound that now bears the tomb of the Musalmân saint Mir Abdâl.

135. At a short distance to the south of the town, there was a vihâr and also a stupa in the garden which *Amradârikâ* had presented to Buddha. Beside the garden there was another stupa erected on the spot where Buddha had announced his approaching *Nirvâna* (or death). Beyond this there was a third stupa, on the spot where the "thousand sons had recognized their mother." A fourth stupa stood over the spot where Buddha was said to have taken exercise, and a fifth, erected on ancient foundations, commemorated the site on which he had explained certain sacred books. A sixth stupa held the relics of one-half of the body of Ananda. (N. B.—The other half was enshrined at Râjagriha). The bearing of these stupas from the garden of *Amradârikâ* is not stated; but as the mass of the existing brick ruins lies to the westward of the southern entrance of the fort, the whole of these monuments must have been situated in that direction. Of the six stupas described by Hwen Thsang it is probable that only two were of any size, namely, that erected on the spot where Buddha had announced his approaching *Nirvâna*, and that which contained the relics of the half body of Ananda. It is much to be regretted that the presence of the Musalman tombs on the top of this ancient stupa effectually precludes any attempt at excavation, otherwise a shaft sunk down through the centre of the mound would probably reveal the purpose for which the monument had been erected. The stupa built by the King of Magadha in Râjagriha, over the other half of the remains of Ananda, is said by Hwen Thsang to have been a superb one. An annual fair is held at the Besârh stupa in the month of Chaitra, when many thousands of people assemble at the shrine of Mir Abdâl. As the occurrence of this fair is regulated by the solar reckoning of the Hindus, and not by the lunar year of the Muhammadans, I conclude that the festival was established long before the time of the Musalman saint. I would

therefore, as the fair is held beside the ruined stupa, connect the festival with some celebration in honour of Buddha or of one of his disciples. Two ornamental stone pillars of mediæval date were found a short time ago in excavation near the foot of the mound.

136. To the westward of the fort, there is a large sheet of water with an island on the east side, on which is situated a small temple dedicated to Mahādeva. Inside the temple all the sculptures found in the ruins of Besārḥ have been collected. The principal sculpture is a group of Mahādeva seated on his bull Nāndi and caressing Durgā, or Gaurī, who is seated on a lion. There is also a standing figure of the four-armed Vishnu with a radiated halo round his head. In his hands he holds a club, a ball, a quoit, and a shell. A third sculpture represents the *Ashta S'akti*, or eight female energies seated on their respective *vdhans* or vehicles. The remaining sculptures are Buddhistical. One is of Buddha the ascetic, two represent the Dhyāni Buddha, Amitābha, while a fourth is a seated figure of the famous Bodhisatwa Avalokiteswara.

137. There are several small sheets of water to the north and north-west of the fort, but when I saw them they were irregular in shape and seemed to me mostly natural hollows filled with the rain which had recently fallen. The natives however say that formerly there were 52 tanks (*Bāwan* Pokhar) around Besārḥ, two of which still exist in the neighbourhood of Bakhra.

138. The remains at *Bakhra* are all situated on a low mound just one mile to the south-east of the village, and two miles to the north north-west of the fort of Besārḥ. The greater portion of this mound is now cultivated, but the whole surface is covered with small fragments of bricks. The edge of the mound is best defined on the western side, where it has an elevation of four feet. The remains consist of—1st, a stone pillar surmounted by a lion; 2nd, a ruined stupa of solid brick; 3rd, a tank; 4th, four small eminences which mark the sites of ancient buildings; and 5th, a very fine life-size statue of Buddha the ascetic, which was discovered only eight years ago. The pillar and the ruined stupa have already been described by Mr. Stephenson, and the site has already been identified by M. Vivien St. Martin, as well as by myself with the Vaisāli of the Buddhists.

139. The lion pillar of Bakhra is situated in the middle of a small

court-yard with small rooms on three sides, the residence of a *Sanyāsi* who has recently settled at this place. The people call him Bâbâ. He is about 30 years of age, and appeared to me very like a sepoy. He was obliging and communicative, and gave me both assistance and information. If he had been surly and disobliging, he might easily have raised religious scruples, and thus have thwarted me from making an excavation round the pillar, which I was particularly anxious to do, as it was evident to me that the column had sunk considerably into the earth. The man had a few followers, and appeared to be very comfortable. There was plenty of food stored in his house, and a fine old well on the east side of the court-yard.

140. The shaft of the pillar is a single block of polished sandstone, 18 feet in height above the present ground level of the court-yard in which it stands, and 27 feet 11 inches above the surrounding fields. The difference between these two measurements, or 9 feet 11 inches, represents the accumulation of rubbish around the pillar above the general level of the country. I made an excavation all round the shaft until I reached water at a depth of 14 feet below the level of the court-yard, and of 4 feet 1 inch below the level of the fields. The water in the old well close by was standing at the same level. As the whole of the shaft exposed by the excavation is polished, it appears to me certain that the pillar must have sunk into the ground at least 4 feet 1 inch in depth, and most probably several feet more, as there was no appearance of any basement at the point reached by my excavation. The whole height of shaft above the water level is 32 feet. I was informed by an old man at Besār that the saheb who excavated the Bakhra stupa left a Bengālī to make an excavation round the pillar, and that just at the water level he found a square pedestal in three steps. Before I began my own excavation, I was told that a previous excavation had been made down to the water level without revealing any inscriptions. I found however a few short records in the curious flourished characters, which James Prinsep called "shell-shaped," and which Major Kittoe thought somewhat resembled Chinese. I believe that these characters belong to the 7th or 8th century. But at whatever period these may have been in use, it is certain that at least 4 or 5 feet more of the shaft must then have been exposed to view. The pillar now leans to the westward, and is from 4 to 5 inches out of the perpendicular

at the ground level. I attribute the sinking of the pillar partly to the insufficiency of the basement, and partly to the want of stiffness in the sub-soil, which is a loose wet sand. In such a soil the basement should have been well spread out, with its foundation resting on wells, so as to offer an effectual resistance to the thrust of the heavy pillar, which with its capital must weigh nearly 50 tons. The shaft alone above the water level weighs 37 tons.

141. The upper diameter of the pillar is 38.7 inches, and the lower diameter at the water level is 49.8 inches, the mean diameter being 44.2 inches, as the slope of the shaft is quite straight. The pillar is surmounted by a bell-shaped capital, 2 feet 10 inches in height, with an oblong abacus of 12 inches, making the whole height of capital 3 feet 10 inches. This forms the pedestal of a lion statue of life-size. The animal is seated facing the north, with his hind legs under him, with his mouth open as if snarling, and his tongue slightly protruded. The attitude is rather stiff, and the fore legs of the animal seem to be both too short and too thick, but the hair of the mane is boldly and cleverly treated, and the general appearance of the statue is certainly striking.

142. There is no inscription on the pillar to declare the object for which it was erected. It is possible that a short inscription may once have existed, for the surface of the pillar has suffered considerably, and in one part,  $2\frac{1}{2}$  feet above the present ground level, the polished surface has peeled off all round. Numerous names of visitors have been cut on the pillar. Some few are of Musalmans, several of Hindus, but the most of Christians. The visitors, I was told, wrote their names in charcoal, and a village blacksmith afterwards traced them roughly with a chisel. The whole surface of the pillar within reach is disfigured with these rude scrawls, of which the neatest and smallest is that of "Reuben Burrow, 1792." Some of the Nāgari inscriptions consist of two short lines, but none of them, as far as I could judge, are more than 200 or 300 years old. The pillar is known by the people as *Bhīm-Sen-ka-lāt* and *Bhīm-Sen-ka-danda*.

143. Immediately to the south of the pillar there is a small tank, 200 feet from east to west, and 150 feet from north to south. It has no name, but is simply called *Kund* or *Pokhar*. To the south, at a distance of 35 feet, there is a low mound of broken bricks, which must have been the site of some ancient building. At short distances

from the south-west and north-west corners of the tank, there are two similar mounds. The probable identification of the tank and mounds will be noticed hereafter.

144. Due north from the pillar, and just outside the court-yard, there is a ruined stupa of solid brick surmounted by a fine, old Pipal tree. This stupa is 25 feet 10 inches in height above the fields, but only 15 feet 11 inches above the present ground level of the pillar. An excavation has been made right into the centre of the mound from the north-west. The excavation, I was informed by an old man, was superintended by a Bengali servant of some Saheb more than 50 years ago; but no discovery was made. This account agrees with that given by Mr. Stephenson, who relates that the excavation was made by a Doctor, resident at Muzafarpur, 30 years ago, that is, previous to 1835, or about A. D. 1805. As the centre of the mass had evidently been reached by the Bengali, I did not think it necessary to make any further excavation.

145. To the north-east of the ruined stupa, at a distance of 250 feet, there is a low mound similar to those near the tank, and due north, at a distance of 500 feet, there is a small temple containing a life-size statue of Buddha the ascetic, which was discovered only eight years ago in digging up some brick walls immediately to the east of the temple. The statue is perfect, not even the nose being broken. There is a small Buddha on each side of the figure, and there are two lions on the pedestal, besides a long inscription, beginning with the usual Buddhist formula. There is no date, but the characters are those of the 8th or 9th century. The spot on which the figure was found was most probably the site of an ancient *vihār* or Buddhist chapel monastery, in which the statue was enshrined. I saw several of the bricks with bevelled edges similar to those that form part of the mouldings of the Great Temple at Buddha Gaya, and of the stupa at Giryek.

146. The lion pillar and the surrounding remains at Bâkhra I would identify with a group of holy buildings described by Hwen Thsang as being situated upwards of one mile to the north-west of the palace of Vaisâli. The exact distance is not mentioned, but the existing remains correspond so closely with his details regarding the situation and nature of the different objects, that there can be no reasonable doubt as to the identity of the whole group. The first

work noticed by Hwen Thsang as being upwards of one mile to the north-west of the palace of Vaisâli is a stupa that was built by King Asoka, of which the purpose is not stated. Beside the stupa there was a stone column from 50 to 60 feet in height, surmounted by the statue of a lion. To the south of the pillar there was a tank which had been excavated by a flock of monkeys for the use of Buddha. At a short distance to the west of the tank there was a stupa erected on the spot where the monkeys climbed a tree and filled Buddha's begging pot with honey. On the south side of the tank there was another stupa erected on the spot where the monkeys offered the honey to Buddha, and at the north-west angle of the tank there was a statue of a monkey.

147. The ruined stupa to the north of the pillar I would identify with Asoka's stupa, and the small tank to the south of the pillar with the celebrated *Markata-hrada* or "Monkeys' Tank," which, as we have already seen, was in the same position with respect to the lion pillar. The two low mounds to the west and south of the tank correspond with the sites of the two stupas built to commemorate the monkeys' offering of honey to Buddha; and the low mound to the north-west agrees exactly with the site of the monkeys' statue. The correspondence between the several objects so minutely detailed by Hwen Thsang and the existing remains is complete. The only point on which there is any seeming discrepancy is the height of the pillar, which was from 50 feet to 60 feet, while the actual pillar may perhaps be less. The height of the lion statue is 4 feet 6 inches, that of the capital is 3 feet 10 inches, and that of the polished shaft down to the water level is 35 feet 10 inches, making altogether a height of only 44 feet 2 inches, but as neither the basement of the pillar nor the end of the polished portion of the shaft have been reached, it is quite certain that the pillar must have been higher than this measurement. I would therefore fix its probable original height at about 50 feet, which would then agree with the measurement of Hwen Thsang.

148. Vaisâli, the capital of the *Lichchhavi* family, was especially famous as the scene of the second Buddhist Synod in 443 B. C. The assembly was held, according to Hwen Thsang, at a spot  $2\frac{1}{2}$  miles to the south-east of the city, but I could find no remains in that direction. Vaisâli was also celebrated as the place where Buddha had

announced his approaching *Nirvāna*. The actual spot was to the westward of the town, but after the announcement, Buddha with his cousin disciple Ananda repaired to the *Kutāgāra* hall, where he addressed his followers for the last time. *Kutāgāra*, which means the "upper-storied hall," was a famous edifice situated in the *Mahāvano Vihāro*, in which Buddha had dwelt during the 5th year of his teaching. *Mahāvano Vihāro* means "the Chapel Monastery of the great forest." Fa-Hian speaks of "a great forest and a chapel of two stories;" but Hwen Thsang makes no allusion to the upper-storied hall, although, as we know from the *Māndhātṛi Sutra* of the *Divya Avadāna*, translated by Burnouf, the *Kutāgāra* Hall was situated on the bank of the *Markata-hrada*, or "Monkey Tank." From Hwen Thsang's silence I infer that this once famous hall, which Fa-Hian had seen about A. D. 410, must have become ruined before A. D. 640. Altogether the agreement of these details is so very close that I think there can be little, if any, doubt that the Bakhra ruins represent the site of the group of sacred objects described by Hwen Thsang. Even the great forest can still be traced in the numerous fine groves of trees which surround the ruins on all sides. The name of Bakhra may possibly have been derived from *Vak* (S. *Vaoh*) "to speak," from the fact that in the *Kutāgāra* Hall Buddha had addressed his disciples for the last time.

#### XV.—KESARIYA.

149. To the north north-west, distant 30 miles from Besārh, and somewhat less than two miles to the south of the large village of Kesariya, stands a lofty brick mound capped by a solid brick tower of considerable size. This ruin has already been brought to notice by Mr. B. H. Hodgson, but no description has been published, and in the Sketch taken by his native artist (Prinsep's Journal, Vol. IV. Plate VII) the mound appears much too high for its breadth, while the stupa (or dagopa) on the top is made much too small.

150. The mound of Kesariya is a ruined mass of solid brick-work, 62 feet in height, and 1,400 feet in circumference at the base of the ruins. On the top of this there is a solid brick stupa, the whole surface of which is ruined, excepting at the base, which is still perfect in several places. In the most perfect part there are 15 courses of surface brick-work still in good order, and in two other places there are 10 and 11 courses perfect. From these three points I made out

the base of the stupa to be 68 feet 5 inches in diameter. My measurement of the height was necessarily rough, as there was no defined edge at the top, the whole being thickly covered with long grass. After much trouble I made out a height of 38 feet  $7\frac{1}{2}$  inches for the cylindrical portion, and of 12 feet  $10\frac{1}{2}$  inches for the dome, or altogether of 51 feet 6 inches. But as the height of the dome cannot have been less than the half diameter of the building, or 34 feet  $2\frac{1}{2}$  inches, the original height of the solid brick-work of this stupa must have been 72 feet 10 inches, and the whole height of the stupa with its pinnacle not less than from 80 to 90 feet, or including the ruined basement on which it stands, not less than 150 feet above the ground.

151. From the ruined state of the lower mound compared with the perfect state of the base of the upper stupa, I am of opinion that the present stupa is of middle age, say from A. D. 200 to 700, and that it was built upon the ruined mass of a much older and much larger stupa. That such a practice was not uncommon, we learn from Hwen Tshang, who describes two stupas at Vaisâli as having been erected on ancient foundations. I feel quite satisfied that such has been the case with the Kesariya Monument, and as all the early stupas are found to be hemispherical, I infer that the lower and earlier stupa must have been of that form. Its great size may be deduced from the breadth of the base of the upper stupa, namely, 68 feet 5 inches, at a height of 62 feet above the ground; and as there must have been a clear terrace all round this stupa, for the perambulation of pilgrims, the actual thickness of the early stupa at this height cannot have been much less than 100 feet, which would give a diameter at base of 160 feet. The height of the hemisphere would of course have been 80 feet, but with the usual square Buddhist capital surrounded by an umbrella, or other pinnacle, the stupa could not have been less than 100 feet.

152. This ancient monument is known to the people as *Râja Benka Deöra*. The similar but smaller stupa at Kasiya is also called a *Deöra*, or, as it is written by Buchanan, *Devhara*. In both cases the name belongs to the upper stupa, and not to the whole mass, as all mounds, whether of earth or brick, in this part of the country, are named *Bhîsa*. *Deöriya*, which is a very common village name in the districts of Tîrhût, Champâran, and Gorakhpur, is applied, I



believe only to such places as possess either a temple or some other holy buildings. Of Râja Ben the people have no tradition, except that he was one of the five Supreme Emperors of India, and he is therefore called *Râja Ben Chakravartti*. The piece of water immediately to the south of the stupa is also named after him, *Râja Ben ka Digha*, or Raja Ben's Tank. I know only of one Raja Vena, whom the Rishis are said to have inaugurated as "Monarch of the earth," but whom they afterwards slew because he would not allow them to worship Vishnu, "Who," exclaimed he, "is this Hari whom you style the lord of sacrifice?" From Vena's right arm, when rubbed by Brahmans, was produced a son named Pirthi, who according to the Vishnu Purâna also become a *Chakravartti Râja*. This Vena Chakravartti is most properly the great Râja Ben to whom the tradition refers.

153. Now it is remarkable that according to the account of Hwen Thsang, this stupa was also referred to a Chakravartti Râja by the Buddhists of the 7th century. He states that at somewhat less than 200 *li* (that is, less than 33 miles, or say about 30 miles,) to the north west of Vaisâli, which is the exact position of the Kesariya stupa, there was an ancient town which had been deserted for many ages. It possessed a stupa built over the spot where Buddha had announced that in one of his former existences he had been a Bodhisatwa, and had reigned over that town as a *Chakravartti Râja*, named *Mahâdeva*. It can hardly, I think, be doubted that the tradition of Râja Ben preserves the very same story which is recorded by Hwen Thsang. That the stupa was intended to commemorate a Chakravartti Râja might also have been inferred from its position at the meeting of four principal roads. "For a Chakravartti Râja," said Buddha addressing Ananda, "they build the *thupo* at a spot where four principal roads meet." Now to the south of Kesariya, within one quarter of a mile of the stupa, the two great thoroughfares of the district cross each other, namely, that from Patna northward to Bettiah, and that from Chapra across the Gandak, north-eastwards to Nepal.

154. On the east side of the Kesariya stupa a gallery has been excavated right to the centre of the building. This is said to have been done upwards of 40 years ago by one Kâsi Nâth Babu, the servant of a Colonel saheb. As the name of "Lieutenant-Colonel Mackenzie, Madras Engineer, 1814," is inscribed on the Bakhra

pillar, I think it probable that the excavation was made by his orders. No discovery was made, and if I am right in my identification of this stupa with that which was erected on the spot where Buddha announced his previous existence as a Chakravartti Raja, it is almost certain that it would not have been the depository of relics or of other objects. The monument was in fact only a memorial stupa, erected to perpetuate the fame of one of Buddha's acts, and not a sepulchral stupa for the reception of relics.

155. To the north north-east of the stupa, and rather less than half a mile distant, there is a small mound which has been partially excavated to furnish materials for the bridges on the high road, which within the last few years have been made from Bakhra to Motihâri viâ Kesariya. The excavations have disclosed the walls of a small temple, 10 feet square inside, and the head and shoulders of a colossal figure of Buddha, with the usual crisp curly hair. The mound, which is about 200 feet square, is called *Râniwâs*, and also Gorai, and the buildings are attributed to some ancient Râni. It appears to me to have been the site of a Vihâra or temple monastery, as portions of cells are still traceable on the eastern side. At the south-west angle there is another smaller mound of brick ruin, 120 feet from north to south and 60 feet from west to east. It is probably the ruin of a temple.

XVI.—LAURIYA ARA-RAJ.

156. Between Kesariya and Bettiah, at the distance of 20 miles to the north-west of the Kesariya stupa, and one mile to the south-west of the Hindu temple of Ara-Râj Mahâdeo there stands a lofty stone column which bears in well preserved and well cut letters several of the edicts of King Asoka. The pillar itself is simply called *Laur*, that is, "the *phallus*;" and the neighbouring village, which lies not more than 100 yards to the westward, is called *Lauriya*. This is the pillar which, on the authority of Mr. Hodgson, has been called the Radhia Pillar. Now as the other pillar to the north of Bettiah is also called *Laur*, and the large village close to it *Lauriya*, while Mr. Hodgson has named it *Mathiah*, I presume that his Munshi intentionally suppressed the phallic name of *Lauriya*, and named the two pillars at random after some of the neighbouring villages. Thus Rahariya, (Rurheea of Indian Atlas Sheet No. 102,) which is Mr. Hodgson's Radhia, lies  $2\frac{1}{2}$  miles to the west north-west

of the southern pillar, while Mathiah lies 3 miles due south from the northern pillar. In describing these pillars I will preserve the characteristic name of *Lauriya*, and for the sake of distinguishing the one from the other, I will add to each the name of the nearest village, thus the village near the southern pillar I shall call *Lauriya Ara-Raj*, and that near the northern pillar *Lauriya Navandgarh*.

157. The Ara-Rāj Pillar is a single block of polished sand-stone, 36½ feet in height above the ground, with a base diameter of 41.8 inches, and a top diameter of 37.6 inches. The weight of this portion only is very nearly 34 tons, but as there must be several feet of rough shaft sunk in the earth, the actual weight of the single block must be about 40 tons. This pillar has no capital, although there can be little, if any, doubt that it must once have been crowned with a statue of some animal. The people, however, know nothing of it, and not a fragment of any kind now exists to suggest what it may have been. The site of the village is a very secluded one, and there are no ruins or other remains to attract attention. It has accordingly escaped the notice of travellers, and the disfigurement of their names, the only record being that of "Reuben Burrow, 1792," besides a few flourished letters, or marks, of the kind which James Prinsep called shell-shaped characters.

158. The edicts of Asoka are most clearly and neatly engraved, and are divided into two distinct portions, that to the north containing 18 lines, and that to the south 23 lines. I made a copy of the inscription by the eye, which I then compared with James Prinsep's text, and afterwards I re-examined every letter in which our copies differed. I also made an inked impression of the whole inscription on paper, which I am now engaged in reducing for publication. But though the variations from Prinsep's text are not many, yet, as no fac-simile has yet been made public, it is important, for the sake of comparison, to afford access to one which has been carefully copied in every letter.

#### XVII.—LAURIYA NAVANDGARH.

159. The lion pillar of Lauriya Navandgarh, which, after Mr. Hodgson, has hitherto been called the Mathiah Pillar, is situated at rather less than half a mile to the north-east of the large village of Lauriya, at 15 miles to the north north-west of Bettiah, and at 10 miles from the nearest point of the Gandak River. As Mr. Hodg-

son's name of Mathiah serves only to mislead, I propose to call the site of this pillar Lauriya Navandgarh, by adding the name of a very remarkable deserted fort which stands just half a mile to the south-west of Lauriya. The village of Mathiah lies no less than 3 miles to the south of the pillar, and is besides both smaller and of less consequence than Lauriya. The name of this Lauriya is printed in Roman letters in the Indian Atlas Sheet No. 102, and even the "stone pillar" itself is inserted in its proper place to the north-east of the village. The deserted fort of Navandgarh is omitted, but it will be found in the Calcutta Map, on the 8-mile scale, as Naonad-garh. The mound is from 250 to 300 feet square at top, and 80 feet in height. On account of its height it was chosen as one of the stations of the Trigonometrical Survey, and for the same reason it commands a most extensive and beautiful view of the well wooded country around it.

160. The remains at Lauriya Navandgarh are particularly interesting, as they are very extensive, and at the same time quite different in character from any others that I have examined. The remains consist of three rows of earthen barrows or huge conical mounds of earth of which two of the rows lie from north to south, and the third from west to east. The stupas hitherto met with have been made either of stone or of brick; but the earliest stupas were mere mounds of earth, of which these are the only specimens that I have seen. I believe that they are the sepulchral mounds of the early kings of the country, prior to the rise and spread of Buddhism, and that their date may therefore be assumed as ranging from about 600 to 1500 B. C. The word stupa meant originally only "a mound of earth," and this is the rendering given to the word by Colebrooke in his translation of the Amarakosha. In the time of Asoka all the stupas were certainly built either of stone or brick, as recorded by Hwen 'Thsang; and although he is silent regarding the material of the earlier stupas of Ajâtasatru and other contemporaries of Buddha, yet, as he makes no mention anywhere of earthen stupas, I presume that all the Buddhist monuments were either of brick or stone. The earthen barrows I would therefore refer to an earlier period, as the stupas or sepulchral mounds raised over the ashes of the rulers of the country, the larger mounds belonging perhaps to the greater or more famous monarchs who had assumed the title of *Chakravartti*

Rajas. Every mound is called simply *Bhisā*, and the whole are said to have been the fortified residences of the Ministers and Nobles of Raja *Uttānpat*, while the fort of Navandgarh was the Raja's own residence. *Uttānapāda*, King of Brahmavarta or Bharatkhand, that is, of the Gangetic Doab, was the son of the Manu *Swayam-bhuva*, the first created of Brahmā, and the progenitor of mankind. Raja Vena, to whom the Kesariya Monument is assigned, was the seventh in descent from Uttānapāda. Another decisive evidence in favour of the great antiquity of these barrows is the fact that Major Pearse, of the Madras Artillery, found one of the small punch-marked silver coins in his excavations amongst them. These coins are certainly anterior to the time of Alexander the Great, and I believe that many of them are as old as 1000 B. C., and perhaps even older.

161. There are three rows of these earthen mounds, of which one line runs from east to west, and the other two lines from north to south. There are five barrows in the east and west row and six barrows in the middle row, while the outer northern row has four large and at least seven small barrows. There are probably several more small mounds which escaped my observation in the jungle surrounding some of the larger mounds, but I do not believe that any barrow of greater height than 5 or 6 feet remains unnoticed. In my Survey of these remains I have attached a separate letter of the alphabet to each mound for the sake of greater clearness of description.

162. In the east and west line there are five mounds marked A to E. Four of these mounds, A, C, D, and E, are covered with fragments of brick, and there are also traces of the walls of small brick buildings on their summits. Mound A is 20 feet in height. Within 5 feet of its top, I excavated a portion of a circular foundation wall, 16 inches thick, formed of single bricks  $20\frac{1}{2}$  inches long and 4 inches thick. There were only four courses of bricks resting on the earth of the mound. This work may either have been the retaining wall of a circular terrace which once crowned the top of the mound, or it may have been the foundation of a tower; but as the wall was only 16 inches thick, the former would seem to be the more probable supposition. Mound B is a simple earthen barrow, 25 feet in height. Mound C, which is 30 feet in height, is thickly covered with broken brick. There are traces of foundation walls on the top, but a former excavation shows that the whole mass is plain earth. There are traces

also of walls on the slopes of the mound; and in an excavation amongst these superficial brick ruins made by Mr. Lynch, Deputy Magistrate of Motihâri, there was found a seal of black earthen-ware, bearing a short inscription in characters of the Gupta period, that is, of the 2nd and 3rd century after Christ. The inscription, which consists of four letters, reads *Ataviḍḍ*. This is most probably only a name which may mean either *Atavi + jā*, "the forest born," or less probably *Ata + vija*, "the cause of motion." At the end of the name there is the *Swāstika*, or mystic cross, and over the name in the middle there is the symbol of *Dharmma*, and to the left, in a slanting direction, a trident, or *trisūl*. The discovery of this seal shows that Navandgarh Lauriya was certainly occupied by the Buddhists as late as the 2nd or 3rd century A. D. Doubtless their occupation continued to a later period, for although both Fa Hian and Hwen Thsang make no allusion to it, their silence is easily accounted for by the fact that the course of their travels did not take either of them into the Bettiah district. The two remaining barrows of this row are somewhat higher, mound D being 35 feet, and E 45 feet. Both of them are covered with broken brick. The top of D had already been opened, and I myself made an excavation on the top of mound E. Both had flat tops, as if terraces had once existed on their summits; and with this impression I began my excavation. At the depth of 4 feet all trace of brick disappeared, the mass of the mound being plain earth. The bricks were large,  $15'' \times 9'' \times 2\frac{3}{4}''$ .

163. None of the barrows of the middle line have any traces of brick upon them, but seem to be made of plain earth. They are all covered with low thorny jungle. The most northerly mound of this line, marked H, is 25 feet in height; the next mound, marked G, is 20 feet; the next F is 50 feet; and the next M is 55 feet. The last two are the highest of all the barrows at Navandgarh Lauriya. The next mound N is only 15 feet high, and the next southerly mound, marked Q, is 25 feet in height. About one-half of the mass of the last mound has been excavated and carried away to Bettiah on bullocks and donkeys. The whole heart of the mound is formed of an extremely hard whitish clay, which is used by the people as a light coloured clay-wash for the walls of their houses. This clay is indeed so hard that it turns the edges of common digging tools. When freshly

cut it glistens, and has a bluish tint. From whence was this clay obtained? There is none now anywhere near the place, the soil being generally light and sandy. Can it have been found here formerly, or was it brought from a distance?

164. In the outer line there are only four large barrows, the most northerly, marked L, being 20 feet in height, and the other three, marked K, J, and R, being each 30 feet. The last mound R, which is the most southerly of this line, has also been excavated for the sake of its stiff white clay, which is similar to that of mound Q of the middle line. Between J and R I traced seven small mounds, of which the largest, marked O, is only  $8\frac{1}{2}$  feet in height. I made an opening in this mound down to the ground level, but without any result, except that it proved the mound to be formed of common hard earth, and not of the indurated glistening white clay which forms the masses of the two barrows Q and R.

165. There is another question regarding these barrows which is perhaps quite as puzzling as that of their origin, namely, from whence was the earth for so many large mounds procured, for there is not a single hollow or excavation of any kind in their neighbourhood? On three sides of the huge mound of Navandgarh the tanks still exist to show from whence its material was obtained, but with respect to the material for the tumuli we are left entirely to conjecture. Between the mounds and the village of Lauriya there is the dry bed of an annual flood stream called the *Tarkāha Nāla*, but its soil is light and sandy, excepting only in the deeper pools, where the water lies for several months. It seems scarcely possible that the earth could have been taken from this sandy channel, and yet it is equally impossible to say from what other place it could have been obtained.

166. The lion pillar of Lauriya Navandgarh stands to the north of the mounds A and B, at a distance of less than 500 feet from each. Its shaft is formed of a single block of polished sandstone, 32 feet  $9\frac{1}{2}$  inches in height, with a diameter at base of 35.5 inches and of 26.2 inches at top. The capital which is 6 feet 10 inches in height, is bell-shaped, with a circular abacus supporting the statue of a lion facing the north. The abacus is ornamented with a row of Brahmani geese pecking their food. The column has a light and elegant appearance, and is altogether a much more pleasing monument than the stouter and shorter pillar of Bakhra. The lion has been

injured in the mouth, and the column itself bears the round mark of a cannon shot just below the capital, which has itself been slightly dislodged by the shock. One has not far to seek for the name of the probable author of this mischief. By the people the outrage is ascribed to the Musalmans, and on the pillar itself, in beautifully cut Persian characters, is inscribed the name of *Mahi-ud-din Muhammad, Aurungzeb, Padshah Alamgir, Ghazi Sanah* 1071. This date corresponds with A. D. 1660-61, which was the fourth year of the reign of the bigoted Aurungzeb, and the record may probably have been inscribed by some zealous follower in Mir Jumla's army, which was then on its return from Bengal, after the death of the Emperor's brother Shuja. The Navandgarh Pillar is much thinner and much lighter than those of Ara-Râj and Bakhra. The weight of the polished portion of its shaft is only 18 tons, or rather less than half that of the Bakhra Pillar, and somewhat more than half that of the Ara-Râj Pillar.

167. The pillar is inscribed with the edicts of Asoka in the same clear and beautifully cut characters as those of the Ara-Râj Pillar. The two inscriptions, with only a few trifling variations, correspond letter for letter. I made a careful copy of the whole for comparison with the text made public by James Prinsep. I made also a facsimile impression in ink, which I am now reducing for publication with that of the Ara-Râj Pillar.

168. The Navandgarh Pillar has been visited by numerous travellers, as it stands in the direct route from Bettiah to Nepâl. There are a few unimportant inscriptions in modern Nâgari, the oldest being dated in *Samvat* 1566 *chait badi* 10, equivalent to A. D. 1509. One of them, without date, refers to some petty Royal Family, *Nripa Nârâyana Suta Nripa Amara Singha*, that is, "King Amara Singha, the son of King Nârâyana." The only English inscription is the name of *Rn. Burrow*, 1792.

169. The pillar itself has now become an object of worship as a phallus or lingam. Whilst I was copying the inscription, a man with two women and a child set up a small flag before the pillar, and placed offerings of sweetmeats around it. They then all knelt before it, bowing down their heads to the ground with their hands behind their backs, and repeating some prayer. The erection of the pillar is ascribed to Raja *Bhim Mâri*, one of the five Pândava bro-



thers to whom most of the pillars in India are now ascribed. I could not learn anything regarding the title of *Māri*. There are two fine Banian trees close to the pillar, one to the north, and the other to the south; but there are no traces of buildings of any kind near it.

# XVIII.—PADARAONA.

170. The large village of *Padaraona*, or *Padaravana*, is situated 12 miles to the west of the river Gandak, 27 miles in a direct line to the north north-west of Navandgarh Lauriya, and 40 miles to the north north-east of Gorakhpur. I believe that it is the ancient *Pāvā*, as it is situated just 12 miles from Kasā, which agrees with the position assigned to *Pāvā*, in the Pali Annals with respect to Kusinagara. The very name of *Pāvā* also seems to be only a corruption of *Padara-vana*, or *Padar-ban*, which might easily be shortened to *Parban*, *Pāwan*, and *Pāvā*.

171. The remains at Padaraona consist of a large mound covered with broken brick, and a few statues. The mound is 220 feet in length from west to east, 120 feet in breadth from north to south, and 14 feet in height at the western end above the fields. The long trench mentioned by Buchanan still exists on the west side, and looks as if a wall had been dug out for the sake of the bricks. About eight years ago a large hole was excavated to the east of the trench by a Zamindar for the sake of bricks. Two houses were built of the materials then obtained, but sufficient trace of the walls still remains to show that they were in straight lines, one of them being parallel to Buchanan's trench. From this I infer that there was a court-yard about 100 feet square, with cells on each side for the accommodation of monks. In the centre there was probably either a stupa or a temple. But if I am right in my identification of Padaraona, with *Pāvā*, the building would almost certainly have been a stupa, for we know that the people of *Pāvā*, after the cremation of Buddha's body, obtained one-eighth of the relics, over which they erected a stupa. The entrance to the court-yard would appear to have been on the east side, where the mound is now low and thickly covered with bricks.

172. In a small roofless brick building at a short distance to the northward, there are a few old figures. This temple is dedicated to Hāthi Bhawāni, or the Elephant Goddess, who is accordingly propi-

tiated with rude votive figures of elephants in baked clay, of which numbers lie scattered about the temple, both inside and outside. The statue called Hāthi Bhawāni represents a squatted male figure with a triple umbrella over his head. The figure appears to be naked, and if so, it must belong to the Jains, and not to the Buddhists. A drawing of it may be seen in Buchanan's *Eastern India*, Vol. 2, Plate I, Fig. 2. There are also two fragments with seated Buddhas, and a third with the upper half of a female figure. On referring to Buchanan I recognized all three fragments as having belonged to the statue sketched as Fig. 2 in his Plate. The principal figure is now gone, but there are a few unimportant fragments not noticed by Buchanan, and in the village there is the pedestal of a statue.

173. I made an excavation on the highest part of the mound on the west side, and to the northward of the Zamindar's excavation. In this I found bricks with rounded edges such as I had noticed in the mouldings of the Great Temple at Buddha Gaya, and of the stupa at Giryek. I found also wedge-shaped bricks of two sizes. The largest ones being only fragments, I was unable to ascertain their length, but their breadth was  $20\frac{3}{4}$  at the end, and  $19\frac{1}{4}$  inches at 6 inches distance. As the larger end was rounded, these bricks must have formed part of some circular building, and most probably of a solid stupa, which would have been just 30 feet in diameter. The smaller bricks were  $8\frac{1}{2}$  inches long,  $5\frac{7}{8}$  inches broad at the widest end, and 5 inches at the narrow end, with a thickness of  $2\frac{1}{4}$  inches. These may have belonged to a small stupa about 9 feet in diameter. In my excavation I found also the base of a pillar of coarse grey sandstone. It was 15 inches square and  $6\frac{1}{2}$  inches high, with a few plain mouldings at the upper edge. The complete excavation of this mound would not be difficult, and the work might be superintended by the Civil Authorities of the place, who live close by.

#### XIX.—KASIA.

174. The village of *Kasia* is situated at the crossing of two great thoroughfares, at a distance of 35 miles due east from Gorakhpur. The name is written *Kasia*, with the short *a* in the first syllable; but I have little doubt that it should be written *Kusia* with the short *u*, for the place corresponds, both in position and in name, with the celebrated *Kusinagara*, or "Town of the Kusagrass," which, as the

scene of Buddha's death, was famous throughout India. This sacred spot was visited both by Fa-Hian and by Hwen Thsang; and the latter has left a detailed account of the various *stupas* which still existed in his time. Most of these have now disappeared, owing partly to the removal of bricks by the people, but chiefly, I believe, to the inundations of the Little Gandak River, which at some former period must have flowed close by the sacred buildings of *Kusinagara*, as there are several old channels between the two principal masses of ruins, which are still occasionally filled during the rainy season.

175. The existing remains have already been described by Buchanan, in his *Eastern India*, Vol. 2, p. 357, and by Mr. Liston in *Prinsep's Journal*, Vol. 6, p. 477; but their accounts are very brief, and offer no attempt to identify the ruins with any of the ancient cities which are known to have existed in this part of the country. The remains consist of—1st, a lofty mound of solid brick-work called *Devisthān* and *Rāmābhār Bhawāni*; 2nd, an oblong mound called the Fort of *Māthā Kuār*, which is covered with broken brick and jungle, and on which stands a brick stupa much ruined; 3rd, a large statue of Buddha the ascetic; 4th, a low square mound covered with broken brick near the village of Anrudhwā; and 5th, a number of low earthen mounds, like barrows, which are scattered over the plain to the north and east of the great mound.

176. The mound called *Devisthān* and *Rāmābhār Tīla* is the ruin of a large ancient stupa of solid brick-work, which is still 49 feet in height above the fields. It is situated somewhat less than one mile to the south-west of Kasīa. On the top, under a fine old Banian tree, is the shrine of the goddess Devi. There is neither statue nor building, but only some votive figures in baked clay, the offerings of the poor people to their favourite Devi. The goddess is also called *Rāmābhār Bhawāni*, because the mound is situated on the western bank of the *Rāmābhār Jhāl*, a large natural sheet of water, which forms part of the bed of the *Roha Nāla*, one of the old channels of the Little Gandak. As the mound is also called *Rāmābhār Tīla*, it is possible that the name may have originally belonged to the stupa. I attempted to make an excavation at the top of the mound, but the large interlaced roots of the Banian tree soon forced me to give up the work. At the south-eastern foot of the mound I discovered a portion of a small stupa formed of very

large bricks, averaging 5 inches in thickness. These bricks were  $17\frac{1}{2}$  inches in length, and wedge-shaped, being  $8\frac{1}{2}$  inches broad at one end, and only 7 inches at the other end. These dimensions would give a diameter of only  $16\frac{1}{2}$  feet to the stupa.

177. The large mound called *Mâthâ-Kuär-ka kot*, or the "Fort of Mâthâ Kuär," is 600 feet in length from north-west to south-east, and from 200 to 300 feet in breadth. At its highest point, which is 30 feet 3 inches in height above the plain, the mound is formed entirely of solid brick-work, which I believe to be the remains of a very ancient stupa. On this point stands a solid tower of brick-work, with sides much ruined, and its top covered with long grass. This is undoubtedly a stupa, and from its position it must be of much later date than the ancient mass of brick-work on which it stands. I conclude that it is a work of middle age, or between A. D. 200 and 600. At present the mass of the tower is only 24 feet thick, but by clearing away the rubbish, I measured a circumference of 86 feet, which gives a diameter of nearly  $27\frac{1}{2}$  feet. The present height of the lower portion is only 15 feet, and that of the grass-covered top 12 feet 9 inches, the whole being 27 feet 9 inches above the ancient foundation, and 58 feet above the plain. But as the original height of this later work was most probably equal to two diameters, or 55 feet, the whole height of the stupa above the plain would have been 85 feet. I drove a horizontal gallery into the centre of the building at its base without making any discovery. I confess that I did not expect to find any thing, as I believe that, whatever relics may have been deposited on this spot, they would have been placed in the more ancient stupa below, which forms the foundation of the present monument. There is a fine Pipal tree close to this stupa.

178. The mound called the Fort of Mâthâ Kuär is situated nearly 1,600 yards to the north north-west of the ruined stupa called Râmâbhâr. Buchanan give the distance as 400 yards, which is most probably a misprint for 1,400 yards. My distance was measured from centre to centre; if taken from foot to foot, the distance would be a little over 1,400 yards. This mound would seem to have been formed of the ruin of two large buildings and of several small ones. The site of one of the larger ones has just been described; that of the other is to the north-westward, the summit of the mound at this point, which is crowned by a large Pipal tree, being 20 feet in height

above the plain. To the east of the stupa there is also a small detached mound, 15 feet 3 inches in height. I made an excavation in the top of this mound, which I abandoned after reaching a depth of 4 feet 3 inches, as I found only broken bricks mixed with earth. Both to the north and south of the stupa there are low mounds, which are probably the remains of small detached towers or other buildings. The top of the large mound is in most parts thickly covered with bricks, but towards the north-west end, where the elevation is low, there are some rather large spaces quite clear of bricks, which may be supposed to represent the court-yards, or vacant spots between the buildings. I noticed many wedge-shaped bricks, which must have belonged to stupas of small size, besides several bricks with one half-face bevelled like those in the mouldings of the Great Temple at Buddha Gaya and of Jarasandha's Tower at Giryek. I was unable to trace any straight lines of surrounding walls, and from the irregular outline of the mound, I incline to believe that it has been formed by the ruin of a considerable number of independent buildings, such as a cluster of stupas of all sizes. From the total absence of statues, I infer that there were probably but few temples on this site.

179. The large statue known as that of *Māthā Kuär*, or the "Dead Prince," is now lying on the ground, at a distance of 1,100 feet from the brick stupa above described. Quite close beside it, to the eastward, there is a low square mound which I believe to be the remains of a temple in which the image was formerly enshrined. The statue, which is made of the dark blue stone of Gaya, is split into two pieces from top to bottom, and is otherwise much injured. The short inscription on its pedestal has been almost worn out by the villagers in sharpening their tools, but the few letters which remain are sufficient to show that the statue is not of older date than the 11th or 12th century. The figure itself is colossal, and represents Buddha the ascetic seated under the Bodhi tree at Buddha Gaya. The whole sculpture is  $10\frac{1}{2}$  feet in height by  $4\frac{1}{2}$  feet in breadth. The height of the figure alone is 5 feet  $4\frac{1}{2}$  inches, the breadth across the shoulders being 3 feet  $8\frac{1}{2}$  inches, and across the knees 4 feet 5 inches. A sketch of this sculpture is given in Buchanan's *Eastern India*, Vol. II, Plate 2.

180. Between the Fort of *Māthā Kuär* and the great stupa on

the *Rāmābhār Jhāl*, there is a low mound of brick ruins about 500 feet square, which is said to have been a *kot* or fort, and to which no name is given, but as it lies close to the village of Anrudhwâ on the north-west, it may be called the Anrudhwâ mound. There is nothing now left to show the nature of the buildings which once stood on this site; but from the square shape of the ruins, it may be conjectured with some probability that they must be the remains of a monastery. There are three fine Pipal trees now standing on the mound.

181. To the north and east of the mound of Mâthâ Kuär the plain is covered with a number of low grassy mounds, from 3 to 6 feet in height, and from 12 to 25 feet in diameter. Regarding these barrows the people have a tradition that gypsies were formerly very numerous about Kasîa, and that these mounds are the tumuli of their dead. I opened three of them, but without making any discovery. They were all formed of plain earth, without any trace of bones, or ashes, or broken bricks. The people call them simply mounds, but I was informed by an old man that he had heard them styled *Bhîmâwat*, and that ghosts were sometimes seen flitting about them. If the name of *Bhîmâwat* has any reference to these ghosts, it might perhaps be translated as the "fearsome place;" but I cannot be certain of the spelling, and it is also possible that the old man may not have remembered the name correctly. I counted 21 of these mounds, but as they are generally not more than 3 or 4 feet in height, it is probable that their actual number is much greater.

182. I have already stated that the site of Kasîa corresponds, both in position and in name, with the ancient city of *Kusinagara*, which was famous throughout India as the scene of Buddha's death. According to Hwen Thsang, *Kusinagara* was situated at 700 *li*, or 116 miles to the north-east of Benares. Now *Kasîa* is 112 miles to the north north-east of Benares in a direct line. Fa-Hian also places *Kusinagara* at a distance of 20 *yojanas* to the north-west of a place which was situated only 8 or 10 miles to the north of Vaisâli, where the *Licchhavi* Nobles had taken a last farewell of Buddha. At 7 miles to the *yojana*, Fa-Hian's measurement would place *Kusinagara* at 148 or 150 miles to the north-west of Vaisâli. Now the distance by the route which I marched is exactly 140 miles in a north-west direction, but as this measurement was taken along the straight lines

of road which have been laid out by the British Authorities, the actual distance by the old winding native roads must certainly have been somewhat greater, or as nearly as possible 150 miles.

183. The only name now associated with the ruins near Kasîa is that of *Māthā Kuār* or the "*Dead Prince*." Mr. Liston gives the name as *Mata*, but a Brahman of the neighbouring village of Bishanpur, who wrote the name for me, spelt it as I have given it, *Māthā*. As this spelling points to the derivation of the word from *Matha*, or *Mātha*, "to kill," I have translated *Māthā Kuār* as the "*Dead Prince*," which I refer to Buddha himself after his death, or, in the language of the Buddhists, after his obtainment of *Nirvāna*. Hwen Thsang when speaking of *Sakya's* assumption of the mendicant's dress, calls him *Kumāra Rāja*, or the "*Royal Prince*;" but although this title was never, I believe, applied to him by the learned after his assumption of Buddhahood, it does not seem at all improbable that it may have remained in common use amongst the people. We know from Hwen Thsang that on the spot where Buddha died there was a brick *vihār* or temple monastery in which was enshrined a recumbent statue of Buddha on his death bed, with his head turned to the north. Now this statue would naturally have been the principal object of veneration at Kusinagara, and although amongst the learned it might have been called the "*statue of the Nirvāna*" yet I can readily believe that its more popular name amongst all classes would have been the "*statue of the Dead Prince*." I am therefore of opinion that the name of *Māthā Kuār*, which still clings to the ruins of Kasîa, has a direct reference to the death of Buddha, which according to his followers took place at Kusinagara on the full moon of Vaisākh, 543, B. C.

184. Owing to the wanderings of the little Gundak river, it is somewhat difficult to follow Hwen Thsang's account of the sacred edifices at Kusinagara. The whole of the existing remains are situated to the eastward of the *Khanūa Nāla*, which is only a branch or inundation channel of the little Gandak river. All the old channels are called *Chawar*; the *Lambuha Chawar*, running between the two ancient stupas, and the *Roha Chawar*, or *Roha Nāla* to the east of the *Rāmābhār Tīla*. An intelligent man, whom I met at Padraona, called the stream to the westward of *Kasîa* the *Hirana*, but the people in the villages about the ruin, knew only the *Khanūa Nāla*, and had never heard of the *Hirana*. Buchanan, however, calls the

*Hirana* a considerable rivulet, which has a course of about 15 miles, and makes it a feeder of the little Gandak (Eastern India, Vol. 2, p. 316); but there is some confusion in his description of this river. The changes of name would however appear to have been as numerous as the changes of channel; for in the time of Hwen Thsang this stream was called the *Ajitavati*, its more ancient name having been *Hiranyavati*, while the present name is *Chota Ganduk*, and the eastern inundation branch is called *Khaniia*. There is now no trace of Hwen Thsang's *Ajitavati*, but the name of *Hiranyavati* is still preserved in the *Hirana* of my *Padraona* informant.

185. At the time of Hwen Thsang's visit, the walls of *Kusinagara* were in ruins, and the place was almost deserted; but the brick foundations of the old capital occupied a circuit of about 12 *li*, that is, of about two miles. After a long and attentive comparison of all our available information, I have come to the conclusion that the famous city of *Kusinagara* must have occupied the site of the mound and village of *Anrudhwā*. The ruined mound, which is about 500 feet square, I would identify as the site of the palace of the *Mallian Kings*, which was in the midst of the city, and to the city itself I would assign an extent of about 1,000 feet on all sides of the palace. This would give a square area of 2,500 feet, or nearly half a mile on each side, with a circuit of 10,000 feet or nearly 2 miles, as recorded by Hwen Thsang. I will now compare the existing remains with the account of the Chinese pilgrim, and with the details given in the *Pali annals of Ceylon*, as translated by *Turnour*.

186. The spot where *Buddha* died is fixed by Hwen Thsang at 3 or 4 *li* (rather more than half a mile) to the north-west of the city, in a forest of *sāl* trees, at a short distance from the western bank of the *Ajitavati* river. The distance and direction correspond exactly with the site of the great mound now called the fort of *Māthā Kuär*. On this spot was erected a great brick *vihār* or temple monastery, in which was enshrined a statue of *Buddha* in a recumbent posture as he appeared when about to enter *Nirvāna*. This *vihār* I would identify with the extensive mass of ruin marked K in my survey of the site at the western end of the mound. Beside the *vihār* there was a *stupa*, 200 feet in height, built by *Asoka*, and a stone pillar, on which was recorded the history of the *Nirvāna*, or death of *Buddha*. This *stupa* I would identify with the foundation or lower part of the



brick tower marked A, now standing on the mound, and of which an account has already been given. Hwen Thsang describes two smaller stupas, and then a third grand stupa which stood on the spot where the Brahman Subhadra had entered into *Nirvāna*.\* As the whole of the buildings above described, as well as three small stupas, were clustered together around the spot where Buddha was said to have died, their ruins, in the lapse of ages, would naturally have formed a single large mound of irregular outline, in all respects similar to the mass of ruins now called *Māthā-Kuür-ka-kot*. I think, therefore, that no reasonable doubt can now remain against the identification of Kasā with the ancient Kusinagara. With regard to the slight difference of name, I have already stated my belief that the name of the present village should in all probability be written *Kusā* instead of *Kasā*, and in favour of this spelling I may add that the name is variously spelt in the Buddhist books as *Kusigrāmaka*, *Kusināra*, *Kusinagara* and *Kusinagari*.

187. After the death of Buddha, the assembled Bhikshus (or mendicants) were consoled by the venerable Aniruddha, who assured them that he saw the Devatas looking down from the skies upon earth, and weeping and bewailing with dishevelled hair and up-lifted arms. Aniruddha was the first cousin of Buddha, being the second son of Amitodana, one of the brothers of Suddhodana, the father of Sākya Sinha. He was one of the ten great disciples of his cousin, and was renowned for his penetrating sight. Accordingly, on the death of Buddha, he took the lead of all the disciples present, and conducted their proceedings. By his directions Ananda made known the death of Buddha to the Mallian nobles, who at once proceeded to the spot with garlands of flowers, and numerous cloths, and music. For six days the body lay in state, attended by the people of Kusināra. On the seventh day, when eight of the Mallian nobles, who had been selected to carry the corpse to the place of cremation, attempted to lift it, they found themselves unable to move it. The amazed nobles, on enquiring of the venerable Aniruddha the cause of this prodigy, were informed that their intention of carrying the corpse through the southern gate to the south of the city, was contrary to the intention of the Devatas. "Lord," said the Mallian nobles, "what-

\* This last I would identify with the high point in the centre of the mound marked B.

ever be the intention of the Devatas, be it acceded to." Accordingly, the corpse was borne by the eight Mallian chieftains, on a bier formed of their lances, through the northern gate to the centre of the town, and then through the eastern gate to the coronation hall of the Mallians, where the funeral pile had been prepared. Four noble Mallians then advanced and applied their torches to the funeral pile, but they were unable to ignite it. Again the baffled nobles inquired of Aniruddha the cause of this second prodigy, who informed them that it was the intention of the Devatas that the corpse should not be burnt until the arrival of Mahâ Kâsyapa the chief disciple of Buddha. At that moment Kâsyapa was on his way from *Pāvā* to *Kusinâra*. On his arrival he perambulated the pile three times, and then opening it at the end, he reverentially bowed down his head at the feet of Buddha. As he rose, the pile spontaneously ignited, and the corpse of the great teacher was consumed.

188. I have given this long account of the obsequies of Buddha for the express purpose of showing the very prominent part that was taken by Aniruddha in all the proceedings. He first consoled the disciples on the death of Buddha; he then explained the causes of the miracles, why the Mallian nobles were unable at first to lift the corpse of Buddha, and afterwards to ignite the funeral pile; and lastly, according to Hwen Thsang, he ascended to the heavens to inform Mâyâ Devi, the mother of Buddha, of her son's death. As the whole of these acts were performed at Kusinâra, we might not unreasonably suppose that some memorial monument of Aniruddha would have been erected there. There is, however, no record of such a monument in Hwen Thsang's account of the sacred edifices at Kusinagara; but I think it more than probable that the village of Anrudhâ must have received its name from some former memorial of the far-sighted Aniruddha, the cousin of Buddha. In Sheet 102 of the Indian Atlas the name of this village is spelt Anihoodwa which is incorrect, as I had the name written down for me by a Brahman of the place. The existence of this name in the immediate vicinity of the ancient monuments of *Kusîa* must, I think, add considerable weight to all the other evidence in favour of the identification of *Kusîa* with the ancient *Kusinagara*.

189. There is a discrepancy between the Ceylonese annals and the accounts of the Chinese pilgrim regarding the site of Buddha's

cremation. According to the Pali annals above quoted, the corpse must have been burnt somewhere to the eastward of the city, and with this account Fa-Hian would seem to agree, for he places the scene of Buddha's death to the northward of the town. Hwen Thsang, however, places the site of the cremation to the northward of the city, across the river Hiranyavati. I think that these different accounts may perhaps be reconciled by identifying the stupa of the cremation with the large brick mound called the *Rāmābhār Tīla*, which being situated opposite to the north-east corner of the Anrudhwā mound (or ancient city as I suppose), might have been loosely described by one party as lying to the north, and by the other as lying to the east.

190. But the *Rāmābhār Tīla* perhaps corresponds more exactly with the site of another stupa, which is described by Hwen Thsang as having been built by Asoka near the ancient dwelling of Chanda, to the north-east of the city gates. This account, however, is somewhat vague, as no particular gate is specified. The existence also of a second stupa at the south-east foot of the *Rāmābhār Tīla* is against this identification, as only one stupa is mentioned on this site by Hwen Thsang. I am therefore strongly inclined to identify the *Rāmābhār Tīla* with the famous cremation stupa; but if this position should be considered too far to the eastward to agree with Hwen Thsang's description, then the cremation tower must have occupied some position to the north of the Anrudhwā mound, in the very midst of the ancient channel of the little Gandak river. I confess, however, that my own opinion is against this conclusion and in favour of the identification of the *Rāmābhār Tīla* with the cremation stupa.

#### XX.—KHUKHUNDO.

191. On leaving Kusinagara, Hwen Thsang directed his steps towards Benares, and after having travelled about 200 *li* (or upwards of 80 miles) to the south-west, he reached a large town, in which dwelt a very rich Brahman devoted to Buddhism. If we adhere closely to the south-west bearing, we must identify this large town with Rudrapur, an ancient place 30 miles to the south-east of Gorakhpur, and 28 miles in a direct from *Kasā*. But as Hwen Thsang speaks of the Brahman's hospitality to travellers going and coming, it would appear certain that the town must have been on the high road leading from Kasā to Benares. Now the high road can

never have passed through Rudrapur, as it would have entailed the passage of the *Rapti* in addition to that of the *Ghâgra* river. I have had some experience in the laying out of roads, and I feel quite satisfied that the old high road must have crossed the *Ghâgra* somewhere below its junction with the *Rapti*. According to the people, the old passage of the *Ghâgra* was at *Maili*, 4 miles to the south of *Kahaon*, and 3 miles to the north of *Bhâgalpur*. From *Kasîa* to this ghat on the *Ghâgra* the road would have passed through the ancient town of *Khukhundo* and the large villages of *Kahaon* and *Bhâgalpur*. Of these three, *Khukhundo* corresponds best with the description of a large town, and as it is 27 miles from *Kasîa* by the present straight road, it must have been about 30 miles by the winding native tracks. I believe, therefore, that it is the large town described by Hwen Thsang in which a rich Brahman had spent his wealth in the magnificent decoration of a Buddhist monastery. *Khukhundo* is not now a place of any note amongst the Brahmans, but it is visited by *Agarwâl Srâwaks* from *Gorakhpur* and *Patna*, who have built a small Jain temple amongst the ruins. By them its proper name is said to be *Kishkindapura*, so called from *Kishkinda*, a mountain in the south of India, famous in the history of Rama. *Khukhundo* must therefore have been a Brahmanical town.

192. The remains at *Khukhundo* consist of a few large tanks and a number of low mounds covered with broken brick and thick jungle. The ruins which lie scattered about over the plain and amongst the fields to the south of *Khukhundo* cover nearly one square mile of ground. All the larger mounds are square in form, and are beyond all doubt the ruins of temples. There are a few low oblong heaps which may possibly be the ruins of long ranges of inferior buildings, but I think it more probable that they are only the collections of brick from the fields. Every large mound has at least one fine lofty-tree growing on its summit, and to the destructive power of the roots of these trees I would attribute the overthrow of the *Khukhundo* temples. I verified this opinion in one instance, that of mound K, by an excavation which showed the floor of a temple completely broken up by the wide spreading roots of a fine tamarind tree. Another notable instance is that of a temple at *Kahaon*, which was standing at the time of Buchanan's visit, but which is now only a

low mound of brick ruin. Its overthrow is attributed by all the villagers to a pipal tree which stands close by the ruin.

193. The mounds of Khukhundo are about 30 in number, but not more than three of them have any names, the rest being called simply *Deöra*, or "mounds." In my Survey of the ruins I have distinguished them by different letters of the alphabet, and under these letters I will now describe them.

194. Mound A is 100 feet square at base and 16 feet in height. There is a *Bel* tree (*Ægle Marmelos*) on the top, and a *Pákar* (*Ficus Venosa*) on the west side. Under the *Bel* tree there is a good figure of the four-armed Vishnu in sandstone, with a peculiar rayed halo, which is boldly pierced through the slab.

195. Mound B, which is 50 feet square at base and 10 feet high, is called *Siva-ka-Tila*, or Siva's mound, because there are the foundations of a *lingam* temple on its summit; the temple was only 8 feet square, but the *lingam* in blue stone is still perfect. There is one good piece of sculpture representing two seated figures, male and female, the latter with a child in her arms. A tree rises behind them, and with its branches forms a canopy over their heads. The figures, which appear to be entirely naked, with the exception of some ornaments, are I believe, Mahádeva and his wife Devi, or Bhawáni, represented as the goddess of fecundity, with a child in her arms. Another sculpture represents a four-armed female standing in what appears to be the prow of a boat. The subordinate figure of Ganesa, on the upper right hand, shows that the principal figure must be Párvati, the wife of Siva.

196. Mound C is 120 feet in length, by 110 feet in breadth, and 15 feet in height. On the top there are the ruined walls of a brick temple, from 4 to 5 feet in height, forming a room of 9 feet square, with a *lingam* in the centre. To the south-west there is a walled entrance built of bricks of different sizes, and containing one piece of moulded brick with a flower ornament. The small size of the room, the mixture of large and small bricks in the walls, and the unusual direction of the entrance, all lead me to conclude that this is an insignificant modern structure, built of bricks of all kinds found on the surface of the mound. On both sides of the entrance there are several sculptures in sandstone, of which the principal is a statue of Ganesa. The other sculptures are a broken statue of Ganesa with

his rat ; the pedestal of a statue with a foot resting on a bull ; a four-armed female, most probably Pârvati, attended by two heavenly musicians ; and a slab containing personifications of the *Navagraha*, or "Nine Planets."

197. Mound D, which is 100 feet square at base and 15 feet in height, is crowned with a fine banian tree. Beneath the tree are collected several pieces and fragments of sculpture, which are partly Brahmanical and partly Jain. The principal sculpture represents a four-armed seated male figure, with beard and moustaches, his right foot resting on a bull. In his four hands he holds a two-pronged sceptre, a necklace, a ball, and a square pole. This is probably a figure of Siva. A second statue represents the four-armed Vishnu standing, and holding in three hands a club, a quoit, and a shell, the fourth hand being open with a lotus flower marked on the palm. A third sculpture is the pedestal of a statue with some naked figures on the face of it, and an antelope in the middle. The antelope is the cognizance of Santanâth, the 16th Jain hierarch. A fourth stone is simply the pedestal of a lingam. The remaining sculptures are two pairs of apparently naked figures, male and female, seated, the latter with a child in her arms. These two sculptures are similar to one in the *Siva Temple* on mound B, which I have supposed to represent Mahâdeva and his wife Bhawâni as the goddess of fecundity. But in these two sculptures the god has a small naked figure of Buddha fixed in the front of his head-dress, from which I infer that these figures probably belong to the Jain religion, while that on mound B certainly belongs to the Brahmanical *Shashti*, the goddess of fecundity.

198. Mound E is about 75 feet square and 15 or 16 feet in height. It is now quite bare, the whole surface having been recently excavated for bricks. Any figures that may have been discovered were probably removed to mound D, which would account for the mixture of Saiva and Vaishnava sculptures now lying on its summit.

199. Mound F is 150 feet in length, by 120 feet in breadth, and 18 feet in height. On the south slope of the mound there is a fine statue of the four-armed Vishnu, in blue stone from the quarries near Gaya.

200. G and H are small low mounds from which bricks have been recently excavated. They are probably the remains of inferior temples.

201. Mound J which is 75 feet square at base and 15 feet in height, has also been recently excavated. I was able to trace the straight walls of a temple, and in the excavated holes I found large thick pieces of plaster, which had once covered the walls. There are no sculptures now lying about this mound, but immediately to the south of it, and outside a small modern Jain temple, there is a very fine standing figure of the four-armed Vishnu in blue stone. The head and arms are gone, but the rest of the sculpture is in good order. On the left side there are the Fish, the Tortoise, and the Boar *Avatars*; and on the right the Buddha and the *Kalki Avatars*. The five missing incarnations must have been lost with the head of the figure. This fine statue was probably enshrined in a temple now represented by mound J.

202. The Jain temple is a small square flat roofed brick building of recent date. There are no Jains now living at Khukhundo, but the temple is visited by the banias and bankers of Gorakhpur and Patna. Inside the temple there is a large naked figure in blue stone, sitting squatted with his hands in his lap. Overhead there is a triple umbrella, and above that a *Dundubhi* musician flying with his drum. On the pedestal there is a bull with a lion on each side. Now the bull is the cognizance of Adi Buddha, the first of the 24 Jain pontiffs. The people are therefore mistaken in calling the figure a statue of *Pārswanāth*, whose well known symbol is a snake. Outside the temple, however, there is another naked Jain statue which has two snakes twisted around its pedestal, and is therefore most probably a figure of *Pārswanāth*. It is possible that this may have been the original figure enshrined in the temple. Another sculpture, in coarse sandstone, represents the same naked couple, male and female, whom I have before described. A tree rises behind them, and with its boughs forms a canopy over their heads. Over all there is a small squatted figure like a Buddha, but naked. The male figure in this sculpture has a lotus in his right hand.

203. Mound K, which is crowned with a fine tamarind tree, is the largest mass of ruin at Khukhundo. It is 120 feet square at base and 16 feet in height. At 10 feet above the ground level I made an excavation at a point on the western edge, where I observed something like a piece of terraced flooring. My excavation uncovered a portion of terraced floor 9 feet square, but completely broken up

by the wide-spreading roots of the tamarind tree, which have pierced the mound in all directions. I found several ornamental bricks with boldly cut flowers and leaves  $1\frac{1}{4}$  inch in depth. Two of these bricks, with opposite curves forming an ogee, had evidently belonged to a cornice. The outer faces of all the bricks are ground smooth, and all the edges are so sharp and clean that the joints between the courses of bricks must have been very fine indeed. As I saw no fragments of figures about this mound, I think it is very probable that the statue belonging to it may be one of those now standing outside the Jain temple.

204. Mound N is low and clear of jungle, having been excavated for bricks within the last few years. It is 45 feet square at base, but only 8 feet high. From its being both low and clear I thought it favourable for excavation. I dug a circular hole of about 8 feet diameter in the top of the mound, and near the middle, at a depth of only 1 foot, I came upon a stone *Yoni*, or receptacle for a *lingam*, fixed in its original position, with the spout end turned towards the north. Further excavation showed that the floor had been broken up, but the marks of the original floor level were quite distinct on the centre stone. As there were no traces of any figures, I gave up the excavation, which had already been sufficient to determine that the mound N is the ruin of a *linga* temple, dedicated to the god Mahādeva.

205. Mound S is 100 feet in length, by 60 feet in breadth, and 12 feet in height towards its western end. The top is crowned with two fine *Siris* trees, under which there is a life-size standing figure in sandstone. The nose and forehead have been lost by a split of the stone, which must have been as old as the figure itself, for there are two holes in the split face which still retain bits of the metal clamps that were used in repairing the statue. The figure has apparently had four arms, and is called *Jug-bhîra* or *Jug-hîra*, "the Champion of the Age," a title which might be applied appropriately to *Vîra*, or Mahāvîra, the last of the 24 Jain hierarchs and the pontiff of the present age.

206. Mound Z is a long low mass of ruin to the south-west of Khukhundo, half hidden amidst bamboos. I found a recent excavation at the western end of the mound, from which the bricks could not have been removed above a few days, as the sides of the excavated



hole still preserved the shape of the walls exactly. In form the building was an octagon of 14 feet across, with projections on the four sides facing the cardinal points. On the north-east side a portion of solid brick-work still remained, but not of sufficient thickness to show whether the building had been solid or hollow. As far as my experience goes, the only buildings of this shape are Buddhist *stupas* as at *Dhamnâr* and *Kholvi* in Malwa, at *Baragaon* (or *Nâlanda*) in Bihâr, and throughout Pegu and Burmah. In all instances the four projecting sides form niches for statues of the previous Buddhas. In the gigantic *Shwe-Dagon* stupa at Rangoon these niches are expanded into distinct temples enshrining colossal figures. I incline therefore to conclude that the building recently excavated in mound Z was a Buddhist stupa. But if Brahmanical temples of this form have ever been built, I should certainly prefer to consider mound Z as the ruin of another orthodox temple, and to add one more to the long list of Brahmanical remains at Khukhundo.

207. With the exception of *Baragaon* (the ancient *Nâlanda*), I have seen no place where the ruins offer such a promise of valuable discovery as at Khukhundo. The mounds are all low, and as they appear to be the ruins of temples, the work of excavation would be comparatively easy. I think that it would be sufficient to remove the top of each mound down to the level of the floor of the building, clearing away the rubbish entirely, but leaving the walls standing to show the plan of the building. Amongst the rubbish we might expect to find both statues and inscriptions, and perhaps other objects, all of which would help to throw light on the rise and progress of modern Brâhmanism, more particularly during the long period of its struggles with expiring Buddhism.

#### XXI.—KAHAON.

208. The village of Kahaon is situated eight miles to the south of Khukhundo, and 46 miles to the south-east of Gorakhpur in a direct line. To the north of the village there is a stone pillar, and also some other remains, which have been described by Dr. Buchanan (*Eastern India*, Vol. 2, p. 366), and by Mr. Liston (*Prinsep's Journal*, Vol. 7, p. 33.) Dr. Buchanan calls the village *Kangho*, but the name is written *Kahaon*, or *Kahâwan*, by the people of the place, and I can only surmise that Buchanan's *Kangho* may have been originally written *Kanghon*, and that the final nasal has been omitted by mistake,

either in copying or in printing. In the inscription on the pillar the village would seem to be called *Kakubharati*; and from some compound of *Kakubha*, such as *Kakubhāwan*, the name of *Kahāwan* would be naturally derived.

209. The remains at *Kahaon* consist of an inscribed stone pillar, an old well, two ruined temples, and several tanks. The whole of these, together with the village itself, are situated on a low but extensive mound of brick ruin. Although the mound is of rather irregular outline on the east side, it may be best described as a square of nearly 500 yards. The village occupies the south-western quarter of the square, and contains some fine old wells built of very large bricks, which are a sure sign of antiquity. The tanks, which would seem to have been connected with the old buildings, are all called *gar*, the meaning of which I was unable to ascertain, but which as applied to water must certainly be derived from the Sanskrit *gri*, to wet. These tanks are, 1st, the *purena-gar*, a dirty pond immediately to the north of the village; 2nd, the *Karnahi-gar*, a small deep pond at the north-west angle of the ruins; 3rd, the *Jhakrahi-gar*, another small pond at the north-east angle, which is also called *Sophā-gar*; and 4th, a large sheet of water to the east of the village called *Askāmini*, or *Akāskāmini-gar*. This is the tank which Buchanan calls *karnahi*, a misprint probably for *Kāmini*. From the size and appearance of the *Askāmini* tank I conclude that from it must have been excavated all the bricks and earth for the construction of the temples and village of *Kahaon*.

210. The *Kahaon* pillar is a single block of coarse grey sandstone, 24 feet 3 inches in height from the ground to the metal spike on the top. The existence of this spike shows that the pillar has once been crowned by a pinnacle of some kind, perhaps by a statue of a lion, or of some other animal rampant; but whatever the pinnacle may have been, its height could not have exceeded  $2\frac{1}{2}$  or 3 feet. The total height of the column therefore must have been about 27 feet. The lower part of the shaft, to a height of  $4\frac{1}{2}$  feet, is a square of 1 foot 10 inches; above this, for a height of 6 feet 3 inches, it is octagonal; then sixteen-sided for a height of 5 feet  $10\frac{1}{2}$  inches; and then circular for a height of 2 feet  $1\frac{1}{2}$  inch. Above this, for a height of 9 inches, the pillar becomes square with a side of 18 inches, and then circular again for a height of  $4\frac{1}{2}$  inches, making the total height

of the shaft 19 feet  $10\frac{1}{2}$  inches. The height of the capital, in its present incomplete state, is 4 feet  $4\frac{1}{2}$  inches. The lower portion, which is  $2\frac{1}{2}$  feet high, is bell-shaped, with circular bands of moulding both above and below. The bell itself is reeded, after the fashion of the Asoka pillars. Above this the capital is square, with a small niche on each side holding a naked standing figure. The square top slopes backward on all sides, and is surmounted by a low circular band, in which is fixed the metal spike already described.

211. On the Western face of the square base there is a niche holding a naked standing figure, with very long arms reaching to his knees. Behind there is a large snake folded in horizontal coils, one above the other, and with its seven heads forming a canopy over the idol. Two small figures, male and female, are kneeling at the feet, and looking up to the idol with offerings in their hands.

212. On the three northern faces of the octagonal portion of the pillar, there is an inscription of 12 lines in the Gupta characters of the Allahabad pillar. There is a good copy of this inscription in Buchanan's Eastern India, Vol. 2, Plate V. and another and better copy in Prinsep's Journal, Vol. 7, Plate I. In the translation given by James Prinsep, the date was read as being 133 years after the decease of *Skanda Gupta*, instead of in the year 133, after the death of Skanda. The true number of the year is 141, as pointed out by Professor Fitz-Edward Hall, but the epoch or era in which the years are reckoned is doubtful. Professor Hall, on the authority of *Bāpu Deva Śāstri*, the learned astronomer of the Benares College, prefers the era of *Vikramaditya*, but I am inclined to adopt that of *Saka*; and this era, I believe, is also preferred by Mr. Thomas. The difference between the two is 135 years. If dated in the Vikrama era the pillar must have been erected in  $141-57=84$  A. D.; but if dated in the Saka era, the period of its erection will be  $141+78=219$  A. D. The latter date I think accords best with the known epoch of the overthrow of the Gupta Dynasty in A. D. 319.

213. The purport of the inscription as translated by Prinsep is simply to record the dedication of five images of Indra by one *Madra*, who calls himself "the constant and friendly patron of *Brahmans*, *Gurus*, and *Yatis*," or "Brahmans, religious teachers, and sages," or ascetics who have subdued their passions. In the present day the term *Yati* is, I believe, applied only to a Jain priest; and although

at first the mention of Brahmins would seem to preclude any reference to the Jain religion, yet the *Yatis* themselves are usually, if not always, Brahmins, and the naked figures with crisp curled hair, on the base and capital of the pillar, must belong either to the Jains, or to the later *Tāntrika* Buddhists. I found a similar naked standing figure, canopied by a seven-headed snake, inside the great mound of old Rājagriha. I am inclined therefore to consider the figure as that of Buddha himself, who is fabled to have been protected under a canopy formed by the seven-headed snake *Muchalinda*, who inhabited the holy tank at Buddha Gaya.

214. Both of the temples described by Buchanan (Eastern India, Vol. 2, p. 367) are now in ruins; and as they are not mentioned by Mr. Liston in 1837, they must have fallen before his visit. Buchanan describes them as pyramidal in form, with two apartments, one over the other, as in the great temple at Buddha Gaya. Inside he found only two fragments of images, of which one showed the feet of a standing figure, with a female votary seated at one side. I made an excavation in the northern ruin, and found that the temple had consisted of a room, 9 feet square, with walls only 1 foot 9 inches in thickness. The building therefore was only 12 feet 6 inches square on the outside. In the slight sketch of this temple, given by Buchanan, no dimensions are noted, but the height of the building is twice and a half its width, or about 30 feet, according to the measurement obtained by my excavation. On the ruin of the southern temple, I found a naked standing figure of life-size, similar to that on the base of the pillar.

215. Immediately to the north of the pillar, and on the highest point of the mound, there are traces of the brick walls of some buildings; and to the south-east, there is an old well which has been lately filled up. Buchanan describes the pillar as having originally "stood in a small quadrangular area, surrounded by a brick wall, and probably by some small chambers." I presume that the pillar must have been placed opposite the entrance of the temple, in which the *Panchendra* or five images of Indra were enshrined. It is probable that there were several temples and other buildings crowded around the pillar, otherwise it will be difficult to account for the great size of the mound, which, though not more than 6 feet in height above the fields, extends from west to east upwards of 1,200 feet, with an average breadth of 400 feet.

## XXII.—HATHIYA-DAH.

216. Twelve miles to the east of Deogaon, and nearly midway between Azimgarh and Benares, there is an old dry tank, called *Hathiya-dah*, or the "Elephants' Tank," with an inscribed pillar standing in the middle of it. The pillar itself is called *Hathiya-dah-ka-lât*. The name is derived from a large stone elephant, 5 feet 6 inches in length and 4 feet 10 inches in height, which stands to the north-west of the pillar, at a distance of 138 feet. Both the pillar and the elephant are formed of a coarse grey sandstone, and they have accordingly suffered from exposure to the weather and are now much worn. The shaft of the pillar is a single block, 12 feet 9 inches in height and 1 foot 5½ inches in diameter, both at base and top. Originally it must have been several feet higher, but the bed of the tank has gradually silted up, and in the month of March bore a fine crop of wheat. The capital is a flat circular slab, slightly rounded on the upper edge, and quite plain. In fact the pillar is a mere cylindrical block intended apparently for the sole purpose of exhibiting the inscription. To the west of the pillar there is a low mound of brick ruins, 170 feet in length from north to south, and 25 feet broad. It is called *Siwari-ka-Tîla*, or "Siwari's Mound;" but the people have no tradition about it, and do not know what is the meaning of the name. Most probably it has some reference to a temple of Siva, which may have stood there in former days. The villages nearest to the pillar are *Singhpura* to the north, *Nowa Basîya* to the east, *Pakari* to the south-east, *Debhao* to the south-west.

217. The pillar is said by the people to have been set up by Râja Gajpat Singh in Samvat 207, or A. D. 150; but both name and date are wrong. *Gajapati*, or "Lord of Elephants," is only one of the titles of the king in whose reign the pillar was erected, and the date is Samvat 1207, or A. D. 1150. This inscription occupies 10 lines, but as the letters are large and coarsely cut, it is not a long one. It records the excavation of the tank by several *Thâkurs*, of whom the chief is *Bellan Thâkur*, the treasurer (Bhândagârîka) of *Gosalla Devi*, the Queen (*Mahârdjî*) of Râja Govinda Chandra Deva, the Lord of Horses, Lord of Elephants, and Lord of Men, on Thursday the 5th of the waning moon of *Ashârh*, in Samvat 1207. The record is not of much value, but it is of later date by 25 years, than any inscription hitherto found of the Râhtor Prince Govinda Chandra Deva of Kanauj.

## XXIII.—BHITARI.

218. The large village of Bhitari is situated on the left bank of the *Gāngi Nadi*, nearly midway between Benares and Ghâzipur, and five miles to the north north-east of *Saidpur*. The *Gāngi* river, which surrounds the village on three sides, is crossed by an old stone bridge of early Muhammedan style. The original bridge consisted of only two small arches, to which two others have since been added at different times. Bhitari has once been a town of some consequence, and it is still a considerable village, with a great number of brick-houses. Both in speaking and in writing its name is usually coupled with that of another place in its vicinity, as *Saidpur Bhitari*. It is thus designated in the *Ayin Akbari*, but the name has been strangely misread by Gladwin as *Syedpoor Nemedi* (Vol. 2, page 202), a mistake that must be due to the faulty nature of the Persian character in which his original was written, as its alphabet is utterly unsuited for the correct record of proper names.

219. The remains at Bhitari consist of several ruined brick mounds, an inscribed stone pillar, and a few pieces of sculpture. Some of the mounds appear to be mere heaps of broken stone and brick, the gatherings from the fields after each season's ploughing. The larger mounds, which run parallel to each other from the bridge towards the village, seem to me to be only the ruins of houses that once formed the two sides of a street. The remaining mounds, which are of square form and isolated, are at present covered with Musalmān tombs; but I have little doubt that all of them were originally either temples or other Hindu buildings. That one of these mounds belonged originally to the Hindus, we have an undoubted proof in the existence of the inscribed stone pillar, which stands partially buried in the rubbish of its eastern slope, and in the discovery at the foot of the pillar of an old brick inscribed with the name of *Sri Kumāra Gupta*. The early occupation of the place by the Hindus is further proved by the discovery of several Hindu statues and *lingams* in the rubbish above the mounds, and by the finding of numerous bricks inscribed with *Kumāra Gupta's* name in the fields. I obtained further proof of the same by the purchase on the spot of three Indo Sassanian coins of base silver, which probably date the 8th or 9th century, and of one small round copper coin with an elephant on the obverse, and a peculiar symbol, supposed to be a *Chaitya*, on the reverse, which

cannot, in my opinion, be of later date than the invasion of Alexander the Great.

220. The Bhitari pillar is a single block of reddish sandstone, apparently from one of the Chunar quarries. The shaft of the pillar is circular, with a diameter of 2 feet  $4\frac{1}{2}$  inches and a height of 15 feet 5 inches. The base is square, but its height is rather uncertain. The upper portion, on which the inscription is cut, has been smoothed, but the lower portion, as far as my excavation went, still bears the marks of the chisel, although not every deep. My excavation was carried down to the level of the adjoining fields, a depth of 6 feet 9 inches below the top of the base, without finding any trace of a pedestal; and as it is most probable that the inscription was placed on a level with the eye, I would fix the height of the original base at about 6 feet, thus giving it an elevation of only 9 inches above the level of the country. The capital is 3 feet 2 inches in height, bell-shaped and reeded like the capitals of the Asoka pillars. A large portion of the capital is broken off on the western side, thus exposing a deep narrow socket, which could only have held a metal spike. The upper portion of the shaft also is split to a depth of about 2 feet. The people say that the pillar was struck by lightning many years ago. It certainly was in the same state when I first saw it in January 1836, and I know of only one reason to make me doubt the accuracy of the people's statement, namely, that both the iron pillar at Delhi and the stone pillar at *Navandgarh Lauriya* have been wantonly injured by cannon shot. If the capital of the Bhitari pillar had been surmounted by a statue of any kind, as it most probably was when the Muhammedans first settled there, I think that the breaking of the capital may be attributed to their destructive bigotry with quite as much probability as to lightning. I found a portion of the broken capital in my excavation of the foot of the pillar.

221. The inscription, which is cut on the eastern side of the base, consists of 19 lines of well shaped characters of the early Gupta period. Unfortunately this face is much weather-worn, and the stone has also peeled off in several places, so that the inscription is now in even a worse condition than when I first saw it in January 1836. The copy which I then made by eye I compared letter by letter with the original inscription on the spot, and although I found several errors in different parts of the inscription, yet the only serious one is

an omission of five letters in the 15th line. I made also an impression of the inscription over which I pencilled all the letters as they appeared to the eye. This is indeed the only successful method of copying a weather-worn inscription, for the edges of the letters being very much rounded, an impression gives only a number of confused and shapeless spots, although many of the letters being deeply cut are distinctly legible, and may easily be copied by the eye. The value of an impression thus pencilled over is very great, as it ensures accuracy in the number of letters, and thus most effectually prevents all errors, both of insertion and omission. The copy which I have thus made is, I believe, as perfect as it is possible to obtain now, considering the weather-worn state of the letters.

222. From the copy which I prepared in January 1836, a translation was made by Dr. Mill, which was published in Prinsep's Journal for January 1837. My re-examination of the inscription has corrected some of Dr. Mill's proposed readings, while it has confirmed many of them, a few being still doubtful owing to the abraded state of the letters. As translated by Dr. Mill, the inscription refers chiefly to the reign of *Skanda Gupta*, closing with his death, and the accession of his infant son. The object of the inscription was to record the erection of a sacred image, the name of which Dr. Mill was unable to read, but which may possibly be recovered when my new copy is retranslated by some competent scholar. In my remarks on the lower inscription on the Bihâr pillar, I have already noticed that all the remaining part of the upper portion of it, which contains the genealogy, is letter for letter identical with the first part of the Bhitari, record, and I repeat the notice here for the purpose of adding that by a comparison of the two inscriptions, every letter of the upper part of both, or about one-third of the whole, may be restored without chance of error.

223. The sculptures now to be seen at Bhitari are very few, but they are sufficient to show the former existence of several large stone temples. In the village there is a colossal figure of *Ganesa*, and a broken bas-relief of the *Navagraha*, or "Nine planets." The colossal statue must almost certainly have been the principal figure enshrined in a temple dedicated to *Ganesa*. There is also a large slab with a half-size two-armed female figure, attended by another female figure holding an umbrella over her, both in very high relief.



The figures in this sculpture are in the same style and in the same attitudes as those of the similar group of the Râja and his umbrella attendant on the gold coins of the Gupta Princes. This sculpture, I believe, represents a queen on her way to worship at the temple. The group is a favourite one with Hindu artists, and as far as my observation goes, it is never used singly, but always in pairs, one on each side of the door-way of a temple. The age of this sculpture I am inclined to fix as early as the time of the Gupta kings, partly on account of the similarity of style to that of their gold coins, partly also because the pillar belongs to one of that family, but chiefly because the bricks found in various parts of the ruins are stamped with the name of *Sri Kumâra Gupta*.

224. If I am right in attributing the sculptures to the time of the Gupta dynasty, or from A. D. 100 to 300, then the Bhitari ruins will be amongst the oldest Brahmanical remains now known to us. For this reason alone I would strongly advocate the excavation of all the isolated mounds, and more particularly of the pillar mound, in which we might expect to find not only all the fragments of the original capital, but also many sculptures and other objects belonging to the temple in front of which the pillar was erected. I have already stated that the bridge over the Gângi river is built entirely of stones taken from the ancient buildings of Bhitari. Many of these stones are squared, and ornamented with flowers and various mouldings, and on one of them I observed the syllable *vi*. This is a mere mason's mark, but as the shape of the letter is the same as that of the Gupta alphabet, the discovery of this single character tends strongly to confirm the accuracy of the date which I have already assigned to the Bhitari ruins on other grounds. As Bhitari is in the *Jâghir* of the enlightened Râja Deo Nârâyan Singh, every facility for excavation would of course be obtained on application to him.

#### XXIV.—BENARES, SARNATH.

225. Benares is celebrated amongst the Buddhists as the scene where their great teacher first expounded his doctrine, or, as they metaphorically express it, where he first began to "turn the wheel of the law." This is one of the four great events in the life of Buddha, and accordingly it forms one of the most common subjects of Buddhist sculpture. In the great Buddhist establishment near Benares, which is described by Hwen Thsang, the principal statue enshrined

in a temple 200 feet in height was a copper figure of Buddha represented in the act of "turning the wheel of the law." I found numerous statues of Buddha in the same attitude during my explorations about Sârnâth in 1835-36, and Major Kittoe discovered several more in 1851-52. I found also many other figures, but those of Buddha the "teacher" were the most numerous. The inscribed pedestal, found by Dewân Jagat Singh in 1794, also belonged to a statue of Buddha the teacher. Similarly at Buddha Gaya, where Sâkya Sinha sat for six years meditating under the Bodhi tree, the favourite statue is that of Buddha the ascetic.

226. The city of Benares is situated on the left bank of the Ganges, between the *Barnâ Nadi* on the north-east, and the *Asi Nâla* on the south-west. The *Barnâ* or *Varanâ* is a considerable rivulet, which rises to the north of Allahabad, and has a course of about 100 miles. The *Asi* is a mere brook of no length, and owing to its insignificant size, it does not appear in any of our most detailed maps. It is not entered in the Indian Atlas, Sheet No. 88, which is on the scale of 4 miles to the inch, nor even in the larger lithographed map of the district of Benares on the double scale of 2 miles to the inch. This omission has led the learned French Academician M. Vivien de Saint Martin to doubt the existence of the *Asi* as a tributary of the Ganges, and he conjectures that it may be only a branch of the *Barnâ*, and that the joint stream called the *Varânasi* may have communicated its name to the city. The *Asi Nâla* will however be found, as I have described it, in James Prinsep's map of the city of Benares, published by Hullmandel, as well as in the small map which I have prepared to illustrate this account of the remains at Benares. The position of the *Asi* is also accurately described by H. H. Wilson in his Sanskrit dictionary, under the word *Varânasi*. I may add that the road from Benares to *Râmnagar* crosses the *Asi* just outside the city, and only a short distance from its confluence with the river. The points of junction of both streams with the Ganges are considered particularly holy, and accordingly temples have been erected both at *Barnâ Sangam* below the city, and at *Asi Sangam* above the city. From the joint names of these two streams, which bound the city to the north and south, the Brahmans derive *Varânasi* or *Vârânasi*, which is said to be the Sanskrit form of the name of Benares. But the more usual deriva-

tion amongst the common people is from Rāja *Banar*, who is said to have rebuilt the city about 800 years ago.

227. The Buddhist remains of Benares are situated nearly due north, and about  $3\frac{1}{2}$  miles distant from the outskirts of the city at a place popularly known by the name of *Sárnāth*. This name, which is usually applied to the great Buddhist tower, or stupa, belongs properly to a small Brahmanical temple on the western bank of the lake, while the great tower itself is called *Dhamek*. An annual fair is held close to the temple of *Sárnāth*, and there is an indigo factory only 200 yards to the north of it. The name of *Sárnāth* was accordingly well known both to the natives and to the English, and when the neighbouring ruins first attracted attention, they were always referred to by that name. The earliest mention of them is by Jonathan Duncan in 1794, in his account of the discovery of two urns by Babu Jagat Singh "in the vicinity of a temple called *Sárnāth*." It is possible that Duncan here refers to the Brahmanical "temple;" but in the subsequent notices by Wilford and James Prinsep, both of whom had resided for many years at Benares, the name of *Sárnāth* is always applied to the great tower. The same name is given to the tower in an engraving which was published in 1834 in Captain Elliot's *Views in India*, published by Fisher and Co.

228. *Sárnāth* means simply the "Best Lord," which title is here applied to the god Mahādeva, whose symbol, the *lingam*, is enshrined in the small temple on the bank of the lake. I believe, however, that the name is only an abbreviation of *Sārangganātha*, or the "Lord of Deer," which would also be an appropriate epithet for Mahādeva, who is frequently represented as holding a deer in his left hand. As the lake in front of the temple is still occasionally called "*Sārang Tāl*," my conjecture that the true name was *Sārangga Nāth* seems a very probable one; but I would refer the epithet to Buddha himself, who in a former existence was fabled to have roamed the woods in this very spot as the king of a herd of deer. But this spot was specially esteemed by the Buddhists on account of a curious story which is given at some length by Hwen Thsang, and which, as illustrative of the Buddhist tenderness for life, I will now relate—"The Rāja of Benares, who was fond of sport, had slaughtered so many deer that the king of the deer remonstrated with him, and offered to furnish

him with one deer daily throughout the year, if he would give up slaughtering them for sport. The Râja consented. After some time, when it came to the turn of a hind, big with young, to be presented to the Râja, she objected that, although it might be her turn to die, yet the turn of her little one could not yet have arrived. The king of the deer (that is, Buddha), struck with compassion, offered himself to the Râja in place of the hind. On hearing the story the Râja exclaimed, "I am but a deer in the form of a man, but you are a man in the form of a deer." He at once gave up his claim to the daily gift, and made over the park for the perpetual use of the deer, on which account it was called the 'Deer Park.' (*Mrigadâva*.) It is curious to learn that a *ramna*, or antelope preserve, still exists in the neighbourhood of *Sârânâth*.

229. The principal remains at Sârânâth are the following:—

1st. The great stone tower called *Dhamek*; 2nd, the remains of a large brick tower opened by Jagat Singh; 3rd, the traces of buildings excavated by myself in 1835-36; 4th, the remains of buildings excavated by Major Kittoe in 1851-52; and 5th, a high mound of solid brick-work, crowned with an octagonal brick tower, called *Chaukandi*, and situated at rather less than half a mile from the great tower of *Dhamek*. With the simple exception of *Chaukandi*, the whole of these remains are situated on an extensive mound of brick and stone ruins, about half a mile long, and nearly a quarter of a mile broad. On the north and east there are three large sheets of water which communicate with one another. To the east lies the *Narokar*, or *Sârang Tâl*, which is 3,000 feet long and 1000 feet broad. On the north-east this communicates with the *Chandokar* or *Chandra Tâl*, which is of about the same size, but of less regular shape. On the north lies the *Naya Tâl*, or "New Tank," which is upwards of half a mile in length, but little more than 300 feet in width.

230. At the north-eastern end of the mass of ruin is situated the village of *Barâhi*, which, as I infer from the spelling, must have been named after *Vajra Vardhi*, a goddess of the later Buddhists. To the west, beyond the bend of the *Naya Tâl*, lies *Guronpur*, or the "Village of Teachers," which in its day was probably inhabited by Buddhist *Gurus*. The *Mrigadâva*, or "Deer Park," is represented by a fine wood, which still covers an area of about half a mile, and extends from the great tower of *Dhamek* on the north to the

*Chaukandi* mound on the south. To the south-west of the great tower the Jains have erected a modern temple of *Pārswanāth*. The temple is white-washed and surrounded by a wall enclosing an area 167 feet square. Since I first surveyed these ruins in 1835, a second or outer enclosure has been added on the east side, the walls of which run right up to the great tower, and cause much inconvenience to visitors, by obstructing their free passage round the building.

231. The most remarkable of the Sárnāth Monuments is the great tower called *Dhamek*. In his hand-book of architecture (Vol. I. p. 15) Mr. Fergusson has stated that "this building was opened by Major Cunningham, under Mr. Prinsep's auspices;" but this statement is incorrect, as the operations were begun by myself before any communication was made to James Prinsep, and were afterwards continued entirely under my own guidance. The cost of opening the tower was shared between James Prinsep, Captain Thoresby, Major Grant, and myself, but the work had been commenced "under my own auspices," and was not suggested to me by James Prinsep. The excavation was begun in December 1834, and closed in January 1836, at a cost of Rs. 517-3-10. But before detailing these operations I will describe the tower itself.

232. The Buddhist *stupa* called *Dhamek* is a solid round tower, 93 feet in diameter at base, and 110 feet in height above the surrounding ruins, but 128 feet above the general level of the country. The foundation or basement, which is made of very large bricks, has a depth of 28 feet below the level of the ruins, but is sunk only 10 feet below the surface of the country. The lower part of the tower, to a height of 43 feet, is built entirely of stone from one of the Chunar quarries, and with the exception of the upper five courses, the whole of this part of the building is a solid mass of stone, and each stone, even in the very heart of the mass, is secured to its neighbours by iron cramps. The upper part of the tower is built entirely of large bricks, but as the outer facing has long ago disappeared, there is nothing now left to show whether it was formerly cased with stone, or only plastered over and coloured to imitate the stone-work of the lower portion. I infer, however, that it was plastered, because the existing stone-work terminates with the same course all round the building, a length of 292 feet. Had the upper part been cased with stone, it is scarcely possible that the whole should have disappeared so completely that

not even a single block out of so many thousands should now remain in its original position. In one part I observed some projecting bricks which appeared very like the remains of a moulding at the base of the dome. On the top I found a small brick cap, 8 feet in diameter and only 4 feet high. From its size I infer that this was the ruin of the base of a small pinnacle, about 10 feet square, which most probably once supported a stone umbrella. I infer this because the figures of Buddha the Teacher are usually represented as seated under an umbrella.

233. The lower part of the monument has eight projecting faces, each 21 feet 6 inches in width, with intervals of 15 feet between them. In each of the faces, at a height of 24 feet above the ground, there is a semi-circular headed niche,  $5\frac{1}{2}$  feet in width, and the same in height. In each of the niches there is a pedestal, 1 foot in height, and slightly hollowed on the top to receive the base of a statue; but the statues themselves have long ago disappeared, and I did not find even the fragment of one in my excavation at the base of the monument. There can be little doubt, however, that all the eight statues represented Buddha the preacher, in the usual form, with his hands raised before his breast, and the thumb and forefinger of the right hand placed on the little finger of the left hand for the purpose of enforcing his argument. Judging by the dimensions of the niches, the statues must have been of life-size.

234. From the level of the base of the niches the eight projecting faces lessen in width to 5 feet at the top; but the diminution is not uniform, as it begins gradually at first, and increases as it approaches the top. The outline of the slope may have been possibly intended for a curve, but it looks much more like three sides of a large polygon. Around the niches seven of the faces are more or less richly decorated with a profusion of flowing foliage. The carving on some of the faces has been completed, but on others it is little more than half finished, while the south face is altogether plain. On the unfinished faces portions of the unexecuted ornamentation may be seen traced in outline by the chisel, which proves that in ancient times the Hindus followed the same practice as at present, of adding the carving after the wall was built.

235. On the western face the same ornamentation of flowing foliage is continued below the niche, and in the midst of it there is a

small plain tablet, which can only have been intended for a very short inscription, such perhaps as the name of the building. A triple band of ornament, nearly 9 feet in depth below the niches, encircles all the rest of the building, both faces and recesses. The middle band, which is the broadest, is formed entirely of various geometrical figures, the main lines being deeply cut, and the intervening spaces being filled with various ornaments. On some of the faces where the spaces between the deeply cut lines of the ruling figures are left plain, I infer that the work is unfinished. The upper band of ornamentation, which is the narrowest, is generally a scroll of the lotus plant with leaves and buds only, while the lower band, which is also a lotus scroll, contains the full blown flowers as well as the buds. The lotus flower is represented full to the front on all the sides except the south south-west, where it is shown in a side view with the *Chakwa* or Brahmani goose seated upon it. This indeed is the only side on which any animal representations are given, which is the more remarkable as it is one of the recesses and not one of the projecting faces. In the middle of the ornament there is a human figure seated on a lotus flower, and holding two branches of the lotus in his hands. On each side of him there are three lotus flowers, of which the four nearer ones support pairs of Brahmani geese, while the two farther ones carry only single birds. Over the nearest pair of geese, on the right hand of the figure, there is a frog. The attitudes of the birds are all good, and even that of the human figure is easy although formal. The lotus scroll with its flowing lines of graceful stalk, mingled with tender buds and full blown flowers, and delicate leaves is very rich and very beautiful. Below the ornamental borders there are three plain projecting bands.

236. I employed two expert masons for twelve months in making full-size drawings of the whole of these bands of ornament. Two plates of the east south-east and south south-west sides were afterwards engraved in Calcutta under my own guidance, for publication by James Prinsep in the *Asiatic Researches*; but his lamented illness put a sudden stop to the work, as his successor, Mr. Curnin, would not allow the mint engraver to continue it.

237. Near the top of the north-west face there are four projecting stones placed like steps, that is, they are not immediately over each other, and above them there is a fifth stone which is pierced with a

round hole for the reception of a post, or more probably of a flag-staff. The lowest of these stones can only be reached by a ladder, but ladders must have been always available, if, as I suppose, it was customary on stated occasions to fix flags and streamers on various parts of the building, in the same manner as is now done in the Buddhist countries of Burmah and Ladâk.

238. With the single exception of the Tâj Mahal at Agra, there is perhaps no Indian building that has been so often described as the great Buddhist tower near Sârnâth. But strange to say, its dimensions have always been very much under-stated, although the circumference might have been very closely ascertained, with the greatest ease, in a few minutes, by measuring, either with a walking stick or with the fore-arm, the breadth of one projecting face and of one recess, which together form one-eighth of the whole. H. H. Wilson, quoting Wilford, states that "Sârnâth is about 50 feet high, and may be as many paces in circumference." Miss Emma Roberts states that it is "about 150 feet in circumference," and "above 100 feet in height." Mr. Fergusson calls it "between 50 and 60 feet in diameter, and 110 feet in height." This last statement of the height is correct, having been taken from a note of mine, which was published by Mr. Thomas in the Bengal Asiatic Society's Journal. This height was carefully measured by myself with an iron chain in January 1835, by means of the scaffolding which I had put up for the purpose of opening the tower. By a previous measurement with a theodolite I had found the height to be 109 feet 10 inches. The breadth of one projecting face and of one recess is 36 feet 6 inches, which multiplied by 8 give 292 feet as the circumference, and a trifle less than 93 feet as the diameter, or nearly double the thickness stated by any one of the authorities just quoted.

239. On the 18th January, 1835, my scaffolding was completed, and I stood on the top of the great tower. On cutting the long grass, I found two iron spikes, each 8 inches long, and shaped like the head of a lance. On the following day I removed the ruined brick pinnacle and began sinking a shaft or well, about 5 feet in diameter. At 3 feet from the top I found a rough stone, 24 inches  $\times$  15 inches  $\times$  7 inches; and on the 25th January, at a depth of  $10\frac{1}{2}$  feet, I found an inscribed slab  $28\frac{1}{2}$  inches long, 13 inches broad, and  $4\frac{1}{2}$  inches thick, which is now in the Museum of the Bengal Asiatic Society. The inscription



consists of the usual Buddhist formula or profession of faith, beginning with the words "*Ye Dhammā hetu prabhavā, &c.*," of which translations have been given by Mill, Hodgson, Wilson, and Burnouf. The following is Hodgson's translation, which has received the approval of Burnouf:—"Of all things proceeding from cause, their causes hath the *Tathāgata* (Buddha) explained. The Great Sramana (Buddha) hath likewise explained the causes of the cessation of existence." The letters of this inscription, which are all beautifully cut, appear to me to be of somewhat earlier date than the Tibetan alphabet, which is known to have been obtained from India in the middle of the 7th century. I would therefore assign the inscription, and consequently the completion of the monument, to the 6th century.

240. On the 22nd January I began to excavate a horizontal gallery on the level of the top of the stone-work, and on the 14th of February, at a distance of 44 feet, the gallery joined the shaft, which had been sunk from above. As I now found that the upper course of stone was only a facing, I sank the gallery itself down to the level of the stone-work, and continued it right through to the opposite side. I thus discovered that the mass of the inner stone-work was only 33 feet in height, while the outer stone-work was 43 feet. In the middle, however, there was a pillar of stone-work, rising 6 feet higher than the inner mass. This was perhaps used as a point from which to describe the circle with accuracy. Small galleries were also made to reach the tops of the east and west faces, but nothing was discovered by these works.

241. The labour of sinking the shaft through the solid stone-work was very great, as the stones which were large (from 2 to 3 feet in length, 18 inches broad, and 12 inches thick) were all secured to each other by iron cramps. Each stone had usually eight cramps, four above, and as many below, all of which had to be cut out before it could be moved. I therefore sent to Chunar for regular quarry men, to quarry out the stones, and the work occupied them for several months. At length, at a depth of 110 feet from the top of the monument, the stone gave place to brick-work, made of very large bricks. Through this the shaft was continued for a further depth of 28 feet, when I reached the plain soil beneath the foundation. Lastly, a gallery was run right through the brick-work of

the foundation, immediately below the stone-work, but without yielding any result.

242. Thus ended my opening of the great tower after 14 months' labour, and at a cost of more than Rs. 500. When I began the work I was not aware that many of the most hallowed of the Buddhist monuments were only memorial *stupas*, raised over spots rendered famous by various acts of Buddha, such as we know from Hwen Thsang's account was the great tower near Benares, which was erected by Asoka near the spot where Buddha had begun to "turn the wheel of the law," that is, to preach his new doctrine. The "tower of the Deer Park near Benares" is likewise enumerated by another Chinese author as one of the "eight divine towers" erected on sites where Buddha had accomplished "many important acts of his terrestrial career," the particular act which he had accomplished at Benares being his preaching. This tower was seen by Fa-Hian in the beginning of the 5th century, who notices that Buddha, when he began to "turn the wheel of the law," sat down looking towards the west. Now on the western face of the great tower there is a small plain tablet, which, as I have said before, could only have been intended for some very short inscription, such as the name either of the tower itself, or of the event which it was intended to commemorate. But whatever it may have been intended for, its position was no doubt significant, and as at Buddha Gaya, where Sâkya had been seated facing the east, his statue was placed in the same position, so at Benares, where, when he began to preach, he had been seated facing the west, I conclude that the western face of the monument erected to commemorate that event would have been the principal side, and that any inscription would certainly have been placed on that side.

243. It now only remains to notice the name by which this great tower is known amongst the people of the neighbouring villages. This name is *Dhamek*, of which no one knows the meaning. It is evidently some compound of *Dharmma*, and bearing in mind that on this spot Buddha first began to "turn the wheel of the law," I would suggest that *Dhamek* is only an abbreviation of the Sanskrit *Dharmopadesaka*, or "Preacher of *Dharmma*," which is indeed the common term now in use to designate any religious teacher. The term is also used in the simpler form of *Dharmma desaka*, which in familiar

conversation would naturally be shortened to *Dhammadek* and *Dhamek*. The special fitness of this name for the great tower in the Deer Park at Benares is so obvious and striking, that I think it needless to offer any further remarks on the subject.

244. At a distance of 520 feet to the westward of *Dhamek*, there is a large circular hole upwards of 50 feet in diameter, surrounded by a very thick brick wall. This is the ruin of the large brick *stupa* which was excavated by Bâbû Jagat Singh, the Dewân of Râja Chait Singh of Benares, for the purpose of obtaining bricks for the erection of Jagatganj. In January 1794 his workmen found, at a depth of 27 feet, two vessels of stone and marble, one inside the other. The inner vessel, according to Jonathan Duncan's account, (*Asiatic Researches* V. p. 131,) contained a few human bones, some decayed pearls, gold leaves, and other jewels of no value. In the "same place" under-ground, and on the "same occasion" with the discovery of the urns, there was found a statue of Buddha, bearing an inscription dated in *Samvat* 1083, or A. D. 1026. An imperfect translation of this inscription was given by Wilford, accompanied by some remarks, in which he applies the statements of the record to the great tower of Dhamek, instead of to the building in which it was actually discovered.

245. At my suggestion Major Kittoe made a search for this statue amongst the plundered stones of Jagatganj, where it was found broken and mutilated. The inscription, however, was still legible and the remains of the figure are sufficient to show that the statue was a representation of Buddha the preacher, and not of Buddha the ascetic. Major Kittoe sent me a transcript of the inscription in modern Nagari, which I strongly suspect to have been *Brahmanized* by his Benares *Pandits*. In its modern Nagari form, as translated for me, it records that *Mahi Pala*, Râja of *Gâurâ* (or Bengal), having worshipped the lotus-like feet of Sri *Dhâmarâsi* ("heap of light,"? Buddha) caused to be erected in Kâsi hundreds of *Isâna* and *Chitraghanta*. Sri *Sthira Pâla* and his younger brother Sri *Vasanta Pâla* having restored religion, raised this tower with an inner chamber and eight large niches." I strongly suspect that the word *Isâna*, which is a name of Siva, has been obtained by a Brahmanical modification of the original. Wilford read *Bhupâla* instead of *Isâna*, but I am unable to offer any conjecture as to the true reading, as I

know not where the original is now deposited. Major Kittoe's facsimile of the inscription is perhaps amongst those deposited by him in the Asiatic Society's Museum.

246. My reasons for fixing on the large round hole, 520 feet to the west of the great tower, as the site of the stupa excavated by Jagat Singh, are the following :—In 1835, when I was engaged in opening the great tower itself, I made repeated enquiries regarding the scenes of Jagat Singh's discovery. Every one had heard of the finding of a stone box which contained bones, and jewels, and gold, but every one professed ignorance of the locality. At length an old man named *Sangkar*, an inhabitant of the neighbouring village of Singhpur, came forward and informed me that when he was a boy, he had been employed in the excavations made by Jagat Singh, and that he knew all about the discovery of the jewels, &c. According to his account the discovery consisted of two boxes, the outer one being a large round box of common stone, and the inner one a cylindrical box of green marble, about 15 inches in height and 5 or 6 inches in diameter. The contents of the inner box were 40 to 46 pearls, 14 rubies, 8 silver and 9 gold earrings (*karn phul*), and three pieces of human arm bone. The marble box was taken to the Barâ Sâhib (Jonathan Duncan), but the stone box was left undisturbed in its original position. As the last statement evidently afforded a ready means of testing the man's veracity, I enquired if he could point out the spot where the box was left. To this question he replied without any hesitation in the affirmative, and I at once engaged him to dig up the box. We proceeded together to the site of the present circular hole, which was then a low uneven mound in the centre of a hollow, and after marking out a small space about 4 feet in diameter, he began to work. Before sunset he had reached the stone box at a depth of 12 feet and at less than 2 feet from the middle of the well which he had sunk. The box was a large circular block of common Chunar sandstone, pierced with a rough cylindrical chamber in the centre, and covered with a flat slab as a lid. I presented this box, along with about 60 statues, to the Bengal Asiatic Society, and it is now in their Museum, where I lately recognized it. In their catalogue, however, it is described as "942 B, a Sarcophagus found in the tope of *Manikyala* (!); Donor, Lieutenant A. Cunningham."

247. The discovery of the stone box was the most complete and

convincing proof that I could wish for of the man's veracity, and I at once felt satisfied that the relics and the inscribed figure of Buddha found by Jagat Singh's workmen had been discovered on this spot, and consequently that they could not possibly have any connexion with the great tower of *Dhamek*. My next object was to ascertain the nature of the building in which the box was deposited. As I had found the box standing on solid brick-work, I began to clear away the rubbish, expecting to find a square chamber similar to those which had been discovered in the topes of Afghanistan. My excavations, however, very soon showed that if any chamber had once existed, it must have been demolished by Jagat Singh's workmen. Sangkar then described that the box was found in a small square hole or chamber only just large enough to hold it. I cleared out the whole of the rubbish until I reached the thick circular wall which still exists. I then found that the relic box had been deposited inside a solid brick hemispherical *stupa*, 49 feet in diameter at the level of the deposit, and that this had been covered by a casing wall of brick,  $16\frac{1}{2}$  feet in thickness; the total diameter at this level was therefore 82 feet. The solid brick-work of the interior had only been partially excavated by Jagat Singh's workmen, nearly one-half of the mass, to a height of 6 feet above the stone box, being then untouched. I made some excavations round the outer wall to ascertain its thickness, but I left the brick-work undisturbed.

248. About 18 years afterwards, the excavation of this *stupa* was continued by Major Kittoe and Mr. Thomas until the whole of the inner mass had been removed, and the foundation of the outer casing exposed. The inner diameter is given by Mr. Thomas as 49 feet 6 inches, the slight excess over my measurement being due to the thickness of a base moulding of the original *stupa*. I have again carefully examined the remains of this monument, and I am quite satisfied that in its original state it was an ancient hemispherical *stupa*, 49 feet in diameter at base, and about 35 or 40 feet in height, including the usual pinnacle. Afterwards, when as I suppose, the upper portion had become ruinous, it was repaired by the addition of a casing wall  $16\frac{1}{2}$  feet in thickness. The diameter of the renewed edifice thus became 82 feet, while the height, inclusive of a pinnacle, could not have been less than 50 feet.

249. On a review of all the facts connected with this ruin, I incline

to the opinion that the inner hemisphere was an ancient relic *stupa*, and that this having become ruinous, it was repaired, and an outer casing added by the brothers *Sthira Pála* and *Vasanta Pála* in A. D. 1026. In the *Mahāwanso* we find the record of similar additions having been made to some of the *stupas* in Ceylon, and I know from personal inspection that many of the great *Dhagopas* of Burmah have been increased in size by subsequent additions.

250. Due south from the great tower of Dhamek, and at a distance of 2,500 feet, there is a lofty ruined mound of solid brick-work, surmounted with an octagonal building. When I first lived at Benares, this mound was always known by the name of *Chaukandi*, of which no one knew the meaning. But during my late visit I found that the old name was nearly forgotten, having been superseded by *Luri-kakodan*, or "Luri's leap." *Luri* was an *Ahir*, who jumped from the top of the octagonal building some years ago, and was killed. The mound itself is 74 feet in height to the floor of the octagonal building, which rises 23 feet 8 inches higher, making a total height of 97 feet and 8 inches. An inscription over one of the door-ways of the building records that it was built in the reign of *Humāyun*, as a memorial of the emperor's ascent of the mound.

251. In 1835 I opened this mound by sinking a well from the floor of the building right down to the plain earth beneath the foundation. I also drove a horizontal gallery to meet the well about half way up the ascent. But as neither of these excavations resulted in any discovery, I then thought it possible that my well might not have been sunk in the axis of the building. I therefore began to widen the well from the point of junction of the gallery until it was nearly 20 feet in diameter. This work was stopped at a depth of 27 feet, by my departure from Benares. I have again examined this ruin, and I am now quite satisfied that my first well was sunk in the very centre of the mound. The absence of any relic chamber shows that this was not a relic tower, a conclusion which is fully borne out by Hwen 'Thsang's description of one of the most remarkable of the sacred edifices near the Deer Park at Benares, which I believe may be identified with the *Chaukandi* mound.

252. At 2 or 3 *li* (or rather less than half a mile) to the southwest of the Deer Park monastery, Hwen Thsang places a *stupa* which was no less than 300 feet in height. This lofty monument

sparkled with the rarest and most precious materials. It was not ornamented with rows of niches, neither had it the usual bell-shaped cupola, but its summit was crowned with a sort of religious vase turned upside down, on the top of which was an arrow. This is the whole of Hwen Thsang's account of this remarkable building, which, although too meagre to gratify curiosity, is still sufficient for the purpose of identification. In position it agrees almost exactly with that of the great brick mound of *Chaukandi* which I have just described. The distance of this last from the ruined mound on which the village of Barâhipur stands, and which I have already identified with the position of the Deer Park monastery, is just half a mile, but the direction is south south-west instead of south-west. With regard to size, it is difficult to say what may have been the height of the *Chaukandi* edifice. My excavations have proved that the centre of the present mound is all solid brick-work; but the subsequent explorations of Major Kittoe have brought to light three immense straight walls about midway up the eastern side, and two more on the western side, which have all the appearance of gigantic buttresses. Now as these walls could not possibly have been required for the stability of the great solid mass below, it seems not unreasonable to conclude that they must in some way have been connected with the support of the upper portion of the building, which no longer exists. Hwen Thsang's account is somewhat vague, but I believe his intention was to describe a dome or cupola narrowed at the base, like the neck of a religious vase reversed. He distinctly states that it was not a bell-shaped cupola, that is, the dome did not spread outwards in the form familiar to us, in the great *Dhagopas* of Rangoon and Pegu. An excellent illustration of the reversed vase form may be seen in a rock cut temple at Ajanta, which is given in Fergusson's *Hand Book of Architecture*, Vol. I. page 20.

253. I will conclude this notice of the remains at Sârânâth Benares with a short account of the excavations which have been made at different times during the last seventy years in the vicinity of the great tower of Dhamek.

254. The earliest excavations of which we possess any record were those made by Bâbu Jagat Singh in 1793-94, for the purpose of obtaining materials, both stones and bricks, for the erection of a market-place, which was named after himself, *Jagat ganj*. I have

already noticed his discovery, January 1794, of the two stone boxes containing a few bones, with some decayed pearls and slips of gold. A brief account of this discovery was published by Jonathan Duncan in the *Asiatic Researches*, Vol. V. page 131, and a more detailed notice by Wilford in a later volume of the same work. I can add little to their accounts, except that the original green stone vase, which Jonathan Duncan presented to the Asiatic Society in 1794, had disappeared before 1834, when I wrote to James Prinsep about it. I may mention also, on the authority of the work-people, that the dilapidated state of the lower part of the Dhamek tower is due entirely to the meanness of Jagat Singh, who, to save a few Rupees in the purchase of new stones, deliberately destroyed the beautiful facing of this ancient tower. As each stone was slowly detached from the monument by cutting out all the iron cramps by which it was secured to its neighbours, the actual saving to the Bâbu could have been but little, but the defacement to the tower was very great, and as the stones were removed at once, the damage done to the tower is quite irreparable.

255. Jagat Singh's discovery would appear to have stimulated the curiosity of the British Officers, for Miss Emma Roberts, writing in 1834, relates that "some 40 or 50 years ago," (that is, about 1794,) "the ruins near Sâr-nâth attracted the attention of several scientific gentlemen, and they commenced an active research by digging in many places around. Their labours were rewarded by the discovery of several excavations filled with an immense number of flat tiles, having representations of Buddha modelled upon them in wax. It is said that there were actually cart loads of these images found in the excavations before mentioned. Many were deposited in the museums and collections of private individuals; but whether they were ever made the subject of a descriptive account seems doubtful, there being at least no public document of the kind." (*Views in India, China, and the Red Sea*, Vol. II. p. 8.) I can add nothing to Miss Robert's account, as all my enquiries have failed to discover any of the wax seals of Buddha above mentioned. I may note, however, that in the temples of Ladâk I have seen small chambers quite full of similar little figures of deceased Lâmas. In Burmah also I have seen small figures of Buddha in burnt clay accumulated in heaps equal to cart loads, both in the caves and in the temples. The figured seals dis-



covered near Sárnâth would appear to have been of a similar kind to those which I extracted from the ruined building close to Jarandha's tower at Giryek, and also to those which I have described as having been found in the ruins at Bakror, opposite to Buddha Gaya.

256. The next excavations, as far as I am aware, were those undertaken by myself in 1835-36. These excavations, as well as the drawings of the elaborate ornament of the great tower, were made entirely at my own expense, the cost during 18 months having been Rs. 1,200. I made several desultory excavations wherever I saw traces of walls, but they all proved to belong to temporary habitations of a late period. At last, after a heavy fall of rain, I observed a piece of terraced floor which I ordered to be cleared for the purpose of pitching my tent upon it. After a few hours' labour, however, the flooring terminated on what appeared to be the edge of a small tank, which was only 13 feet 9 inches square. Continuing the work, I found the bases of pillars in pairs surrounding the square. Amongst the rubbish inside the square, I found an elaborately sculptured bas-relief, in grey sandstone, representing the *Nirvâna* of Buddha. The stone had been broken into four pieces, of which one was missing, but the remaining three pieces are now in the Calcutta Museum. This sculpture I consider particularly interesting, as the subject is treated in a novel and striking manner. In the ordinary representations of the death-bed scene, the spectators are confined to a few attendants, who hold umbrellas over the body or reverentially touch the feet. But in the present sculpture, besides the usual attendants, there are the *Nava-graha* or "Nine Planets" in one line, and in a lower line, the *Ashta Sakti*, or "eight female energies," a series of goddesses apparently belonging to one of the later forms of Buddhism. This sculpture is well worthy of being photographed.

257. Further excavation showed that the small pillared tank, or court-yard, was the centre of a large building, 68 feet square, of which the outer walls were  $4\frac{1}{2}$  feet thick. My exploration was not completed to the eastward, as the walls of the building in that direction had been entirely removed by some previous excavation, with the exception of detached portions of the foundation, sufficient to show that it corresponded exactly with the western half of the building. The central square was apparently surrounded by an open verandah, which gave access to ranges of five small rooms or cells

on each of the four sides of the building. In all the cells I found pieces of charred wood, with nails still sticking in some of them, and in the middle cell on the western side I found a small store of unhusked rice only partially burnt. In a few places I found what appeared to be pieces of terraced roofing, and in one place a large heap of charcoal. On the south side the central room was lost by previous excavation, but on the north side I found a room entirely open towards the verandah, as if it was a hall, or place of general meeting for the resident monks. Inside this room there was the base or pedestal of what I believe to have been a small votive *stupa*, the top of which probably reached to the roof and took the place of a pillar. A small drain led under-ground from the north-west corner of the central square to the outside of the building on the north, for the purpose, as I conclude, of carrying off the rain-water.

258. The building which I have just described would appear to have been a *Vihāra*, or "Chapel Monastery" that is, a monastery with a chapel or temple forming an integral part of the building. From the thickness of the outer wall I infer that this edifice was not less than three or four stories in height, and that it may have accommodated about 50 monks. The entrance was probably on the south side, and I think that there must have been a statue of Buddha in the northern verandah. The bas-relief which I found in the central square almost certainly formed one of the middle architraves of the court.

259. Continuing my excavations in the high ground to the westward, I came upon the remains of a building of a totally different description. The walls of this edifice were 3 feet thick throughout and I found the plaster still adhering to the inner walls of what I will call the verandahs, with borders of painted flowers, quite fresh and vivid. The mass of the building consisted of a square of 34 feet; with a small porch on each of the four sides. The building was divided into three parts from west to east, and the central part was again sub-divided into three small rooms. I think it probable that these three rooms were the shrines of the Buddhist Triad, *Dharmma*, *Buddha*, and *Sangha*, and that the walls of the two long rooms or verandahs to the north and south were covered with statues and bas-reliefs. The entrance verandah of one of the vihar caves at *Kānheri*, in Salsette, is adorned in a similar manner, and even in the present day the inner walls of the temples

both in Ladāk and in Burmah are covered with figures of Buddha. This also, we know from Hwen Thsang's account was the style of the walls of the great vihār in the Deer Park at this very place, and a similar style of ornamentation prevailed both at Buddha Gaya and at Nālanda. Outside the walls also I found a great number, about 50 or 60, of large deeply carved stones, which had once formed part of a magnificent frieze, with a bold projecting cornice. The face of the frieze was ornamented with small figures of Buddha seated at intervals in peculiar shaped niches, which I have traced from the rock hewn caves of Dhamnār in Malwa to the picturesque but fantastic *Kyongs* of Burmah. A few of these stones may now be seen in the grounds of the Sanskrit College at Benares. As I found no traces of burnt wood, I am inclined to believe that the roof of the building was pyramidal, and that the general appearance of the edifice must have been strikingly similar to that of the great temple of Brambanan, depicted in the 2nd volume of Raffles's Java.

260. Whilst engaged in excavating the walls of this temple, I was informed by *Sangkar*, Rājbar of Singpur, the same man who had pointed out to me the position of the relic box in Jagat Singh's *stupa*, that whilst he was engaged in digging materials for Jagatganj, the workmen had come upon a very large number of statues, all collected together in a small building. The walls were pulled down and the bricks were carried away, but the statues were left untouched in their original position. I at once commenced an excavation on the spot pointed out by Sangkar, which was only a few feet to the north of the temple just described. At a depth of 2 feet below the surface, I found about 60 statues and bas-reliefs in an upright position, all packed closely together within a small space of less than 10 feet square. The walls of the building in which they had been thus deposited had been removed, as stated by Sangkar, but the remains of the foundation showed a small place of only 11 feet square outside. I made a selection of the more perfect figures, which, together with the bas-reliefs, I presented to the Asiatic Society. A sketch of the principal bas-relief, which represents the four great events in the career of Śākya Muni, has been published as Plate 1 of M. Foucaux's translation of the Tibetan history of Buddha. A second bas-relief represents the same four scenes, but on a smaller scale. A third bas-relief, which gives only three scenes, omitting the *Nirvāna*, has a short inscription below in two lines, which records the sculpture to

have been the gift of Hari Gupta. The characters of this inscription which are of the later Gupta type, show that this piece of sculpture is certainly as old as the 3rd or 4th century. Some of the seated figures were in excellent preservation, and more particularly one of Buddha the teacher, which was in perfect condition, and coloured of a warm red hue. The remaining statues, upwards of 40 in number, together with most of the other carved stones which I had collected, and which I left lying on the ground, were afterwards carted away by the late Mr. Davidson, and thrown into the Barnâ river under the bridge, to check the cutting away of the bed between the arches.

261. As the room in which I found all these sculptures was only a small detached building, and as it was quite close to the large temple which I have just described, I conclude that the whole of the sculptures must have belonged to the temple, and that they were secreted in the place where I discovered them, during a time of persecution, when the monks were obliged to abandon their monasteries and take refuge in Nepâl. This conclusion is partly borne out by the fact that I found no statues within the walls of the temple itself.

262. To the north of the temple, at a distance of 26 feet, my excavations uncovered a large single block of stone, 6 feet in length, by 3 feet in height, and the same in thickness. The stone had been carefully squared, and was hollowed out underneath, forming a small chamber, 4 feet in length, by two feet in breadth, and the same in height. This large stone has also disappeared, which is the more to be regretted, as I think it highly probable that it was the celebrated stone, described by Hwen Thsang, on which Buddha had spread out his *kashâya* to dry, after washing it in the neighbouring tank. Certain marks on the stone appeared to the Buddhists to represent the thread lines of the web of Buddha's cloth, as "distinctly as if they had been chiselled." Devout Buddhists offered their homage before the stone daily; but whenever heretics, or wicked men, crowded round the stone in a contemptuous manner, then the dragon (*Nâga*) of the neighbouring tank let loose upon them a storm of wind and rain.

263. My excavations at Sârnâth were brought to a close suddenly by my removal to Calcutta. Luckily I had prepared plans of the buildings while the exhumation was going on, for nothing whatever

now remains of all my excavations, every stone and every brick having been removed long ago.

264. The last excavations at Sârnâth were made at the expense of Government under the personal superintendence of Major Kittoe. On his departure for England in January 1853, in ill-health, he carried away all his measurements and memoranda for the purpose of compiling an account of his discoveries for publication. His continued ill-health and early death effectually prevented the fulfilment of this intention, and no one, as far as I can learn, knows what has become of his papers. His drawings, which were numerous and valuable, were sent to the India House Museum by Mr. Thomason. One of them has since been published in 1855 by Mr. Fergusson in his "Hand Book of Architecture,"—Vol. I. page 7; and another in 1856, by Mrs. Spiers, in her "Life in Ancient India"—page 267. Major Kittoe's inscriptions were entrusted to the charge of the Asiatic Society in Calcutta, evidently in deposit for the sake of safety, as he hoped to return again to India, and to prepare them for publication with his own hand.

265. My account of Major Kittoe's discoveries must necessarily be brief, as the only information which I possess is contained in a long letter from himself, dated 19th May, 1852, and in Mr. Thomas's "Note on the excavations at Sârnâth," which was published in the Bengal Asiatic Society's Journal for 1854, page 469. In writing to Major Kittoe previously I had mentioned the *three* stupas which I had myself opened, and which I have already described. In reply he wrote, "How do you make out *three* towers at Sârnâth? I make out *four*, to say nothing of innumerable smaller affairs down to the size of a walnut, which I had laid bare." Attached to this he gave a rough sketch of the ground, showing the position of the fourth tower to be immediately to the north of Jagat Singh's stupa, where I have accordingly inserted it, on his authority, in my survey of the ruins. Further on he writes, "I have laid bare *chaityas* upon *chaityas*, four and five deep, built one over the other." In another place he describes the oblong court-yard which was excavated by himself, at a distance of 125 feet to the westward of the great tower, as a "large quadrangle, or *hospital*, for I have found pestles and mortars, *sills* (or flat stones for mashing,) *loongas*, &c. &c." This is the quadrangle marked Z in my plan of the ruins. It is 60 feet long from

west to east, and 42 feet broad, and is surrounded by a low wall 3 feet thick and  $1\frac{1}{2}$  foot high above the level of the terraced floor, parts of which still remain. Fixed in this wall are the stumps of twelve stone pillars, which are split in all directions as if destroyed by fire. I agree with Major Kittoe in thinking that this quadrangle is probably the ruin of a hospital.

266. In reply to a question about stone umbrellas, Major Kittoe wrote to me as follows: "I have got hold of two, one in fragments (*burnt*), of say 6 feet diameter, mushroom-shaped, and another, *also burnt*, but not broken, elegantly carved in scroll on the inside, but nearly defaced by the action of saltpetre."

267. Of the great tower itself, Major Kittoe's opinion was that "arrangement was precisely the same as at Rangoon, rows and rows of small temples, umbrellas, pillars, &c. around the great tope. They all run north and south, and east and west, large and small." To this account he added a small rough sketch showing the arrangement of the smaller stupas about the great tower. This sketch I have inserted in my survey in dotted lines. Judging from the arrangement of the subsidiary buildings about the great stupas of Burmah and Ladák, I have every reason to accept Major Kittoe's sketch as a correct outline of what he had himself ascertained by excavation; but as the sketch is not drawn to scale, the relative sizes and distances may not perhaps be quite accurate.

268. Of his other discoveries he wrote as follows: "I have got fine specimens of carved bricks, and two heads of Buddha, made of pounded brick and road-earth, coated with fine shell lime, in beautiful preservation. I have a fine head of a female in white marble (partly calcined) and a portion of the arm. It has been a nearly life-size figure of *Párvati*."

269. It will have been observed that every excavation made near Sárnáth has revealed traces of fire. I myself found charred timber and half burnt grain. The same things were also found by Major Kittoe, besides the evident traces of fire on the stone pillars, umbrellas, and statues. So vividly was the impression of a great final catastrophe by fire fixed in Major Kittoe's mind, by the discoveries made during his excavations, that he thus summed up his conclusions to me in a few words: "*All has been sacked and burnt*, priests, temples, idols, all together. In some places bones, iron, timber, idols, &c., are

all fused into huge heaps; *and this has happened more than once.*" Major Kittoe repeated this opinion in almost the same words when I saw him at Gwalior in September, 1852. I will recur to this subject again before I conclude my account of the discoveries at Sárnâth.

270. On Major Kittoe's departure from Benares, the excavations were continued at first under Mr. E. Thomas, and afterwards under Professor FitzEdward Hall. To the former gentleman we are indebted for a general account of the state of the excavations at the time of his assuming charge, and more especially for a very clear and interesting description of the ancient monastery which was then being exhumed, and of the various articles which were discovered within its precincts. This work was subsequently completed by Mr. Hall, and I have made a plan of the building as it now appears. Mr. Thomas calls it an "old Buddhist monastery," and with this identification I fully agree. According to Hwen Thsang, there were no less than 30 monasteries about the Deer Park at Benares, which together contained 3,000 monks, or an average of 100 monks each. Now the building under review contains no less than 28 separate apartments, and if one of these be set aside as a shrine for a statue of Buddha, and a second as a hall for teaching, there will remain 26 cells for the accommodation of monks. Again, judging from the thickness of the walls, I am of opinion that the building could not have been less than 3 or 4 stories in height. Assuming the latter to have been the actual height, the building would have contained 104 cells, and therefore may possibly have been one of the 30 monasteries noted by Hwen Thsang.

271. The ground plan of the monastery shows a central court, 50 feet square, surrounded by pillars which must have supported an open verandah or cloister in front of the four ranges of cells. In the north-east corner of the court-yard there is an old well, 4 feet 10 inches in diameter, and 37 feet deep. As this well is placed on one side, I infer that the middle of the court was occupied by a *stupa*, or a statue, or more probably perhaps by a holy tree, as I could not find any traces of the foundation of a building. On the outside, the building is 107 feet square. In the centre room on the north side, which is 18 feet in length, there are two large stones placed against the walls as if intended for the reception of statues. This also was Mr. Thomas's opinion. This room I believe to have been the shrine of the monas-

tery. In the centre room on the south side there is a "square, elaborately corniced block," which Mr. Thomas believed to have been the throne for a seated figure of Buddha. I incline, however, to the opinion that this was the seat of the teacher for the daily reading and expounding of the Buddhist scriptures. The cells on each side of these two central rooms are somewhat larger than those on the eastern and western sides of the court, and were therefore probably assigned to the senior monks. The common cells are  $8\frac{1}{2}$  feet by 8 feet and each has a separate door.

272. The ground plan of this monastery is similar to that of the large caves at Bâgh and Ajanta, sketches of which may be seen in Mr. Fergusson's "Hand-Book of Architecture," Vol. I. pp. 33, 34. The plan is in fact almost identical with that of the Bâgh cave, the only difference being the want of cells in the cave monastery on the side opposite to the sanctuary, which was necessarily left open for the sake of affording light to the interior. The great cave at Junir is also similar in plan, but it is apparently of older date, as it wants the sanctuary opposite the entrance.

273. The destruction of this large monastery would appear to have been both sudden and unexpected, for Mr. Thomas records that Major Kittoe found "the remains of ready-made wheaten cakes in a small recess in the chamber towards the north-east angle of the square." Mr. Thomas himself also found portions of wheat and other grain spread out in one of the cells. These discoveries would seem to show that the conflagration had been so sudden and rapid as to force the monks to abandon their very food. Such also is Mr. Thomas's opinion, conveyed in the following vivid description: "The chambers on the eastern side of the square were found filled with a strange medley of uncooked food, hastily abandoned on their floors,—pottery of every-day life, nodes of brass produced apparently by the melting down of the cooking vessels in common use. Above these again were the remnants of the charred timbers of the roof, with iron nails still remaining in them, above which again appeared broken bricks mixed with earth and rubbish to the height of the extant walls, some 6 feet from the original flooring. Every item here bore evidence of a complete conflagration, and so intense seems to have been the heat, that in portions of the wall still standing, the clay, which formed the substitute for lime in binding the brick-work, is baked to



a similar consistency with the bricks themselves. In short, all existing indications lead to a necessary inference that the destruction of the building, by whomsoever caused, was effected by fire applied by the hand of an exterminating adversary, rather than by any ordinary accidental conflagration."

274. This opinion was expressed by Mr. Thomas in 1854, before the whole of the monastery had been exhumed. A later account has since been published by Dr. Butter in 1856, who states his opinion that "the burnt grain and masses of half fused iron discovered by Mr. Hall corroborate the conclusions drawn by previous explorers, that the monastery had been destroyed by fire."

275. During my stay at Benares I examined the collection of articles found by Professor Hall in the various excavations which he conducted at Sârânâth, and which are now deposited in the museum of the college. The only article requiring special notice is No. 18, an impression in burnt clay, of a seal,  $1\frac{1}{2}$  inch in diameter, with two lines of Sanskrit, surmounted by a lozenge-shaped device, with two recumbent deer as supporters. The device of the two deer is significant, as it no doubt shows that the seal must have belonged to some person or establishment attached to the monastery of the Deer Park. The end of the upper line and the whole of the lower line of the inscription are too much injured to be made out satisfactorily. The inscription begins with the word *Sri Saddharmma*, "the auspicious true *Dharmma*," and the letters at the end of the first line look very like *rakshita* the "preserver." This would be a man's name *Sri Saddharmma Rakshita*, "the cherisher of the true *Dharmma*," a title not uncommon amongst the Buddhists. Of the lower line I am unable to suggest any probable rendering.

276. In the absence of any general plan of the ruins, showing the extent of the explorations carried on by Major Kittoe and his successors, I do not think it would be advisable to undertake any further excavations at Sârânâth, Benares: I have already suggested that the ground immediately around the great tower should be levelled for the purpose of affording easy access to visitors. In carrying out this operation, every fragment of sculpture should be carefully preserved, as I think it very probable that some portions of the statues, which once adorned the eight niches of the great tower, may be discovered in the masses of rubbish now lying in heaps at its foot. It might

perhaps be worth while to make a few tentative excavations in the mass of ruins to the north and north-west of the great tower, by digging long narrow trenches from west to east, and from north to south. Should these trenches uncover the remains of any large buildings, the work might then be continued. But should nothing promising be discovered, I would recommend the immediate stoppage of the work.

A. CUNNINGHAM, *Colonel,*  
*Archæological Surveyor to the Government of India.*



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1862.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.

Height of the Cistern of the Standard Barometer above the Sea-level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | o                             | o                                             | o    | o     |
| 1     | 29.607                                          | 29.675                                    | 29.538  | 0.137   | 83.2                          | 87.6                                          | 80.3 | 7.3   |
| 2     | .669                                            | .715                                      | .620    | .095    | 85.0                          | 91.2                                          | 80.8 | 10.4  |
| 3     | .660                                            | .699                                      | .617    | .082    | 81.3                          | 85.6                                          | 77.8 | 7.8   |
| 4     | .558                                            | .621                                      | .474    | .147    | 82.6                          | 88.0                                          | 79.0 | 9.0   |
| 5     | .465                                            | .518                                      | .378    | .140    | 83.2                          | 94.0                                          | 79.0 | 15.0  |
| 6     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 7     | .456                                            | .531                                      | .408    | .123    | 82.3                          | 87.8                                          | 77.6 | 10.2  |
| 8     | .520                                            | .587                                      | .472    | .115    | 83.4                          | 87.0                                          | 80.0 | 7.0   |
| 9     | .521                                            | .575                                      | .453    | .122    | 84.7                          | 88.6                                          | 81.4 | 7.2   |
| 10    | .468                                            | .512                                      | .394    | .118    | 83.2                          | 87.6                                          | 79.6 | 8.0   |
| 11    | .438                                            | .493                                      | .361    | .132    | 83.2                          | 88.8                                          | 79.6 | 9.2   |
| 12    | .422                                            | .480                                      | .372    | .108    | 82.3                          | 85.0                                          | 80.2 | 4.8   |
| 13    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 14    | .465                                            | .515                                      | .394    | .121    | 82.0                          | 87.0                                          | 79.2 | 7.8   |
| 15    | .395                                            | .454                                      | .345    | .109    | 81.7                          | 85.0                                          | 79.6 | 5.4   |
| 16    | .404                                            | .439                                      | .358    | .081    | 81.3                          | 84.2                                          | 79.0 | 5.2   |
| 17    | .460                                            | .557                                      | .401    | .156    | 79.6                          | 81.6                                          | 78.4 | 3.2   |
| 18    | .587                                            | .638                                      | .538    | .100    | 83.0                          | 88.0                                          | 79.6 | 8.4   |
| 19    | .573                                            | .632                                      | .498    | .134    | 83.4                          | 88.4                                          | 80.2 | 8.2   |
| 20    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 21    | .461                                            | .511                                      | .401    | .110    | 83.7                          | 87.6                                          | 81.2 | 6.4   |
| 22    | .426                                            | .471                                      | .356    | .115    | 85.2                          | 90.9                                          | 80.2 | 10.7  |
| 23    | .432                                            | .484                                      | .383    | .101    | 84.0                          | 89.0                                          | 80.3 | 8.7   |
| 24    | .493                                            | .561                                      | .423    | .138    | 83.3                          | 86.8                                          | 80.4 | 6.4   |
| 25    | .473                                            | .516                                      | .412    | .104    | 84.7                          | 88.4                                          | 82.0 | 6.4   |
| 26    | .444                                            | .490                                      | .380    | .110    | 84.6                          | 90.6                                          | 80.8 | 9.8   |
| 27    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 28    | .559                                            | .642                                      | .470    | .172    | 81.8                          | 85.2                                          | 79.3 | 5.9   |
| 29    | .631                                            | .694                                      | .564    | .130    | 84.3                          | 89.8                                          | 77.4 | 12.4  |
| 30    | .620                                            | .674                                      | .546    | .128    | 85.5                          | 91.4                                          | 81.6 | 9.8   |
| 31    | .684                                            | .741                                      | .636    | .105    | 83.8                          | 87.8                                          | 81.2 | 6.6   |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers, are derived from the twenty-four hourly Observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1862.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Thermo-<br>meter. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a Cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humidity,<br>complete saturation be-<br>ing unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|
|       | °                               | °                   | °                   | °                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                   |
| 1     | 80.2                            | 3.0                 | 78.7                | 4.5                          | .0961                            | 10.31                                            | 1.58                                                                    | .87                                                               |
| 2     | 81.0                            | 4.0                 | 79.0                | 6.0                          | .970                             | .37                                              | 2.16                                                                    | .83                                                               |
| 3     | 78.9                            | 2.4                 | 77.7                | 3.6                          | .931                             | .02                                              | 1.22                                                                    | .89                                                               |
| 4     | 80.0                            | 2.6                 | 78.7                | 3.9                          | .961                             | .33                                              | .35                                                                     | .88                                                               |
| 5     | 79.9                            | 3.3                 | 78.2                | 5.0                          | .946                             | .15                                              | .74                                                                     | .85                                                               |
| 6     | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 7     | 79.7                            | 2.6                 | 78.4                | 3.9                          | .952                             | .23                                              | .35                                                                     | .88                                                               |
| 8     | 80.8                            | 2.6                 | 79.5                | 3.9                          | .986                             | .57                                              | .39                                                                     | .88                                                               |
| 9     | 81.0                            | 3.7                 | 79.1                | 5.6                          | .973                             | .40                                              | 2.02                                                                    | .84                                                               |
| 10    | 80.1                            | 3.1                 | 78.5                | 4.7                          | .955                             | .25                                              | 1.64                                                                    | .86                                                               |
| 11    | 80.3                            | 2.9                 | 78.8                | 4.4                          | .964                             | .36                                              | .53                                                                     | .87                                                               |
| 12    | 80.0                            | 2.3                 | 78.8                | 3.5                          | .964                             | .36                                              | .22                                                                     | .90                                                               |
| 13    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 14    | 79.5                            | 2.5                 | 78.2                | 3.8                          | .946                             | .17                                              | .30                                                                     | .89                                                               |
| 15    | 79.4                            | 2.3                 | 78.2                | 3.5                          | .946                             | .17                                              | .20                                                                     | .89                                                               |
| 16    | 78.8                            | 2.5                 | 77.5                | 3.8                          | .925                             | 9.96                                             | .28                                                                     | .89                                                               |
| 17    | 77.7                            | 1.9                 | 76.7                | 2.9                          | .902                             | .74                                              | 0.95                                                                    | .91                                                               |
| 18    | 80.5                            | 2.5                 | 79.2                | 3.8                          | .976                             | 10.48                                            | 1.34                                                                    | .89                                                               |
| 19    | 80.4                            | 3.0                 | 78.9                | 4.5                          | .967                             | .37                                              | .59                                                                     | .87                                                               |
| 20    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 21    | 80.8                            | 2.9                 | 79.3                | 4.4                          | .979                             | .51                                              | .56                                                                     | .87                                                               |
| 22    | 80.9                            | 4.3                 | 78.7                | 6.5                          | .961                             | .26                                              | 2.35                                                                    | .81                                                               |
| 23    | 81.4                            | 2.6                 | 80.1                | 3.9                          | 1.005                            | .75                                              | 1.42                                                                    | .88                                                               |
| 24    | 80.8                            | 2.5                 | 79.5                | 3.8                          | 0.986                            | .57                                              | .36                                                                     | .89                                                               |
| 25    | 81.1                            | 3.6                 | 79.3                | 5.4                          | .979                             | .48                                              | .94                                                                     | .84                                                               |
| 26    | 81.0                            | 3.6                 | 79.2                | 5.4                          | .976                             | .45                                              | .94                                                                     | .84                                                               |
| 27    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 28    | 78.9                            | 2.9                 | 77.4                | 4.4                          | .922                             | 9.93                                             | .47                                                                     | .87                                                               |
| 29    | 80.6                            | 3.7                 | 78.7                | 5.6                          | .961                             | 10.29                                            | .99                                                                     | .84                                                               |
| 30    | 81.3                            | 4.2                 | 79.2                | 6.3                          | .976                             | .43                                              | 2.29                                                                    | .82                                                               |
| 31    | 80.2                            | 3.6                 | 78.4                | 5.4                          | .952                             | .21                                              | 1.89                                                                    | .84                                                               |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1862.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer for<br>each hour during the<br>month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture for each hour<br>during the<br>month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|---------------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                                | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                                   | o    | o     |
| Mid-<br>night. | 29.526                                          | 29.689                                                       | 29.405  | 0.284   | 81.7                          | 84.8                                                                | 79.8 | 5.0   |
| 1              | .517                                            | .679                                                         | .401    | .278    | 81.3                          | 83.6                                                                | 78.6 | 5.0   |
| 2              | .511                                            | .666                                                         | .395    | .271    | 81.0                          | 83.1                                                                | 78.0 | 5.4   |
| 3              | .496                                            | .665                                                         | .388    | .277    | 80.8                          | 83.0                                                                | 77.8 | 5.2   |
| 4              | .506                                            | .655                                                         | .386    | .269    | 80.5                          | 82.6                                                                | 77.6 | 5.0   |
| 5              | .502                                            | .665                                                         | .389    | .276    | 80.4                          | 82.2                                                                | 77.4 | 4.8   |
| 6              | .519                                            | .691                                                         | .395    | .296    | 80.6                          | 82.6                                                                | 78.4 | 4.2   |
| 7              | .534                                            | .704                                                         | .403    | .301    | 81.2                          | 83.0                                                                | 78.8 | 4.2   |
| 8              | .546                                            | .714                                                         | .412    | .302    | 82.6                          | 84.8                                                                | 79.4 | 5.4   |
| 9              | .548                                            | .714                                                         | .400    | .314    | 83.9                          | 86.6                                                                | 79.2 | 7.4   |
| 10             | .553                                            | .741                                                         | .406    | .335    | 84.9                          | 87.8                                                                | 78.9 | 8.9   |
| 11             | .548                                            | .738                                                         | .414    | .324    | 85.4                          | 89.8                                                                | 78.3 | 11.5  |
| Noon.          | .535                                            | .722                                                         | .401    | .321    | 86.1                          | 89.7                                                                | 77.8 | 11.9  |
| 1              | .517                                            | .704                                                         | .391    | .313    | 86.8                          | 94.0                                                                | 80.4 | 13.6  |
| 2              | .494                                            | .691                                                         | .368    | .323    | 86.7                          | 91.4                                                                | 80.6 | 10.8  |
| 3              | .474                                            | .668                                                         | .346    | .322    | 86.3                          | 90.9                                                                | 80.6 | 10.3  |
| 4              | .464                                            | .645                                                         | .345    | .300    | 85.4                          | 89.2                                                                | 79.5 | 9.7   |
| 5              | .461                                            | .636                                                         | .356    | .280    | 84.8                          | 88.6                                                                | 79.4 | 9.2   |
| 6              | .477                                            | .658                                                         | .369    | .289    | 83.8                          | 87.8                                                                | 79.0 | 8.8   |
| 7              | .493                                            | .672                                                         | .367    | .305    | 83.0                          | 86.8                                                                | 79.0 | 7.8   |
| 8              | .514                                            | .689                                                         | .386    | .303    | 82.6                          | 86.6                                                                | 79.0 | 7.6   |
| 9              | .527                                            | .710                                                         | .398    | .312    | 82.3                          | 84.6                                                                | 78.8 | 5.8   |
| 10             | .542                                            | .724                                                         | .407    | .317    | 82.0                          | 84.4                                                                | 78.6 | 5.8   |
| 11             | .543                                            | .718                                                         | .419    | .299    | 81.7                          | 84.0                                                                | 78.8 | 6.8   |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers, are derived from the Observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1862.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.      | Mean Wet Bulb Thermometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew Point. | Mean Elastic force of Vapour. | Mean Weight of Vapour in a Cubic foot of air. | Additional Weight of Vapour required for complete saturation. | Mean degree of Humidity, complete saturation being unity. |
|------------|----------------------------|---------------------|---------------------|---------------------------|-------------------------------|-----------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------|
|            | o                          | o                   | o                   | o                         | Inches.                       | Troy grs.                                     | Troy grs.                                                     |                                                           |
| Mid-night. | 79.6                       | 2.1                 | 78.5                | 3.2                       | .0955                         | 10.29                                         | 1.08                                                          | 0.91                                                      |
| 1          | 79.3                       | 2.0                 | 78.3                | 3.0                       | .949                          | .22                                           | .02                                                           | .91                                                       |
| 2          | 79.1                       | 1.9                 | 78.1                | 2.9                       | .943                          | .16                                           | 0.98                                                          | .91                                                       |
| 3          | 79.1                       | 1.7                 | 78.2                | 2.6                       | .946                          | .19                                           | .88                                                           | .92                                                       |
| 4          | 78.8                       | 1.7                 | 77.9                | 2.6                       | .937                          | .10                                           | .88                                                           | .92                                                       |
| 5          | 78.8                       | 1.6                 | 78.0                | 2.4                       | .940                          | .15                                           | .79                                                           | .93                                                       |
| 6          | 78.9                       | 1.7                 | 78.0                | 2.6                       | .940                          | .13                                           | .88                                                           | .92                                                       |
| 7          | 79.4                       | 1.8                 | 78.5                | 2.7                       | .955                          | .29                                           | .92                                                           | .92                                                       |
| 8          | 80.1                       | 2.5                 | 78.8                | 3.8                       | .964                          | .36                                           | 1.32                                                          | .89                                                       |
| 9          | 80.7                       | 3.2                 | 79.1                | 4.8                       | .973                          | .42                                           | .71                                                           | .86                                                       |
| 10         | 81.0                       | 3.9                 | 79.0                | 5.9                       | .970                          | .37                                           | 2.12                                                          | .83                                                       |
| 11         | 81.1                       | 4.3                 | 78.9                | 6.5                       | .967                          | .32                                           | .36                                                           | .81                                                       |
| Noon.      | 81.4                       | 4.7                 | 79.0                | 7.1                       | .970                          | .35                                           | .60                                                           | .80                                                       |
| 1          | 81.9                       | 4.9                 | 79.4                | 7.4                       | .983                          | .47                                           | .74                                                           | .79                                                       |
| 2          | 81.8                       | 4.9                 | 79.3                | 7.4                       | .979                          | .44                                           | .74                                                           | .79                                                       |
| 3          | 81.6                       | 4.7                 | 79.2                | 7.1                       | .976                          | .41                                           | .61                                                           | .80                                                       |
| 4          | 81.1                       | 4.3                 | 78.9                | 6.5                       | .967                          | .32                                           | .36                                                           | .81                                                       |
| 5          | 80.7                       | 4.1                 | 78.6                | 6.2                       | .958                          | .26                                           | .20                                                           | .82                                                       |
| 6          | 80.3                       | 3.5                 | 78.5                | 5.3                       | .955                          | .25                                           | 1.85                                                          | .85                                                       |
| 7          | 80.1                       | 2.9                 | 78.6                | 4.4                       | .958                          | .30                                           | .52                                                           | .87                                                       |
| 8          | 79.9                       | 2.7                 | 78.5                | 4.1                       | .955                          | .27                                           | .41                                                           | .88                                                       |
| 9          | 79.9                       | 2.4                 | 78.7                | 3.6                       | .961                          | .33                                           | .25                                                           | .89                                                       |
| 10         | 79.7                       | 2.3                 | 78.5                | 3.5                       | .955                          | .27                                           | .20                                                           | .90                                                       |
| 11         | 79.5                       | 2.2                 | 78.4                | 3.3                       | .952                          | .25                                           | .12                                                           | .90                                                       |

All the Hygrometrical elements are computed by the Greenwich Constants.

# Meteorological Observations.

v

## Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1862.

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                 |
|-------|-----------------------|---------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| 1     | ...                   | Inches<br>0.82                  | S. & S. E.                        | Cloudy till 8 P. M. cloudless afterwards ; also raining at 1 A. M. and from 11 A. M. to 2 P. M.                            |
| 2     | 121.0                 | ...                             | S.                                | Cloudless till 7 A. M. Scatd. ☁ till 5 P. M. Scatd. ☁ & ☁ afterwards.                                                      |
| 3     | ...                   | 1.06                            | S. & W.                           | Cloudless till 4 A. M. cloudy afterwards ; also raining between 11 A. M. & 1 P. M.                                         |
| 4     | ...                   | ...                             | S. & W.                           | Cloudy ; also slightly drizzling at 1 A. M. & at 7 & 8 P. M.                                                               |
| 5     | 117.0                 | 1.66                            | S. & W.                           | Scatd. clouds till 1 P. M. cloudy afterwards ; also raining between 1 & 2 A. M. & between 6 & 8 P. M.                      |
| 6     | ...                   | ...                             | Sunday.                           |                                                                                                                            |
| 7     | 112.4                 | 1.60                            | S. & S. E. & S. W.                | Cloudy ; also raining between 1 & 5 A. M. & also at 4 P. M.                                                                |
| 8     | ...                   | 0.42                            | E. & S. & S. E.                   | Cloudy ; also raining between 1 & 4 A. M. ; also between 8 & 9 A. M. & also between Noon & 1 P. M.                         |
| 9     | 121.4                 | ...                             | S. & S. E.                        | Scattered clouds till 7 P. M. cloudless afterwards.                                                                        |
| 10    | 114.0                 | 0.51                            | S. & E. & S. E.                   | Cloudy ; also constantly drizzling.                                                                                        |
| 11    | 120.0                 | 0.30                            | S. & S. E. & E.                   | Cloudy ; also raining between 3 & 5 P. M.                                                                                  |
| 12    | ...                   | 0.36                            | W. & S. W. & calm.                | Cloudy ; also constantly drizzling.                                                                                        |
| 13    | ...                   | 0.36                            | Sunday.                           |                                                                                                                            |
| 14    | ...                   | 0.34                            | S. W.                             | Cloudy ; also constantly raining.                                                                                          |
| 15    | ...                   | 0.12                            | S. W. & S. & S. E.                | Cloudy, also drizzling at Noon, & also between 5 & 7 P. M.                                                                 |
| 16    | ...                   | ...                             | S. W. & S. E.                     | Cloudy ; also drizzling at 9 A. M. at Noon, & at 11 P. M.                                                                  |
| 17    | ...                   | 0.72                            | S. & S. W.                        | Cloudy ; also constantly drizzling.                                                                                        |
| 18    | ...                   | 0.16                            | S.                                | Cloudy till 3 A. M. Scatd. ☁ till Noon, cloudy afterwards ; also drizzling at Midnight & 1 A. M. & also between 11 & Noon. |
| 19    | ...                   | ...                             | S.                                | Cloudy.                                                                                                                    |
| 20    | ...                   | ...                             | Sunday.                           |                                                                                                                            |
| 21    | 121.4                 | 0.26                            | S. E. & S.                        | Cloudy ; also drizzling between 1 & 2 A. M. & also raining between 11 & Noon.                                              |
| 22    | 127.8                 | 0.08                            | N.                                | Scattered ☁ till 3 P. M. cloudy afterwards ; also slightly drizzling at 8 & 9 P. M.                                        |
| 23    | ...                   | 2.02                            | N.                                | Cloudy ; also raining occasionally.                                                                                        |

☁ Cirri, ☁ Cirro strati, ☁ Cumuli, ☁ Cumulo strati, ☁ Nimbi, ☁ Strati,  
☁ Cirro cumuli.



*Meteorological Observations.*

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1862.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                             |
|-------|-----------------------|---------------------------------|-----------------------------------|----------------------------------------------------------------------------------------|
| 24    | ...                   | 0.17                            | S. & E.                           | Cloudy ; till 6 P. M. Scattered \-i afterwards ; also raining from Midnight to 3 A. M. |
| 25    | ...                   | ..                              | S. & S. E.                        | Cloudy, till 11 A. M. Scatd. \-i & \-i afterwards ; also slightly drizzling at 9 A. M. |
| 26    | ...                   | 0.26                            | S. & E.                           | Scatd. \-i & \-i till 6 P. M. cloudy afterwards ; also raining at 7 & 8 P. M.          |
| 27    | ...                   | 1.15                            | <i>Sunday.</i>                    |                                                                                        |
| 28    | ...                   | 0.40                            | S. & S. E. & E.                   | Cloudy ; also raining at 7 & 11 A. M. & also at 9 P. M.                                |
| 29    | 123.0                 | 0.34                            | S. & S. E.                        | Cloudy till 10 A. M. Scatd. \-i & \-i afterwards ; also raining at 4 & 5 A. M.         |
| 30    | 122.0                 | ...                             | S.                                | Cloudy till 7 A. M. Scatd. \-i afterwards.                                             |
| 31    | ...                   | 0.20                            | S. & S. E.                        | Scatd. clouds ; also slightly raining at 2 & 11 A. M. & also between 1 & 2 P. M.       |

# Meteorological Observations.

## Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1862.

### MONTHLY RESULTS.

|                                                                |    |    | Inches |
|----------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month,                    | .. | .. | 29.515 |
| Max. height of the Barometer occurred at 10 A. M. on the 31st, | .. | .. | 29.741 |
| Min. height of the Barometer occurred at 4 P. M. on the 15th,  | .. | .. | 29.345 |
| <i>Extreme range</i> of the Barometer during the month,        | .. | .. | 0.396  |
| Mean of the daily Max. Pressures,                              | .. | .. | 29.571 |
| Ditto ditto Min. ditto,                                        | .. | .. | 29.452 |
| <i>Mean daily range</i> of the Barometer during the month,     | .. | .. | 0.119  |

|                                                              |    |    |      |
|--------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                     | .. | .. | 83.2 |
| Max. Temperature occurred at 1 P. M. on the 5th,             | .. | .. | 94.0 |
| Min. Temperature occurred at 5 A. M. on the 29th,            | .. | .. | 77.4 |
| <i>Extreme range</i> of the Temperature during the month,    | .. | .. | 16.6 |
| Mean of the daily Max. Temperature,                          | .. | .. | 87.9 |
| Ditto ditto Min. ditto,                                      | .. | .. | 79.8 |
| <i>Mean daily range</i> of the Temperature during the month, | .. | .. | 8.1  |

|                                                               |    |    |        |
|---------------------------------------------------------------|----|----|--------|
|                                                               |    |    | o      |
| Mean Wet Bulb Thermometer for the month,                      | .. | .. | 80.2   |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, .. |    |    | 3.0    |
| Computed Mean Dew-point for the month,                        | .. | .. | 78.7   |
| Mean Dry Bulb Thermometer above computed Mean Dew-point, ..   |    |    | 4.5    |
|                                                               |    |    | Inches |
| Mean Elastic force of Vapour for the month, ..                | .. | .. | 0.961  |

|                                                                         |    |    |             |
|-------------------------------------------------------------------------|----|----|-------------|
|                                                                         |    |    | Troy grains |
| Mean Weight of Vapour for the month, ..                                 | .. | .. | 10.31       |
| Additional Weight of Vapour required for complete saturation, ..        |    |    | 1.58        |
| Mean degree of humidity for the month, complete saturation being unity, |    |    | 0.87        |

|                                                       |    |    |            |
|-------------------------------------------------------|----|----|------------|
|                                                       |    |    | Inches     |
| Rained 26 days, Max. fall of rain during 24 hours, .. | .. | .. | 2.02       |
| Total amount of rain during the month, ..             | .. | .. | 13.31      |
| Prevailing direction of the Wind, ..                  | .. | .. | S. & S. E. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1862.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Date.     | N.           | Rain on. | N. E. | Rain on. | E. | Rain on. | S. E. | Rain on. | S. | Rain on. | S. W. | Rain on. | W. | Rain on. | N. W. | Rain on. | Calm. | Rain on. | Missed. |
|-----------|--------------|----------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|-------|----------|---------|
|           | No. of days. |          |       |          |    |          |       |          |    |          |       |          |    |          |       |          |       |          |         |
| Midnight. | 1            | 1        |       |          | 3  | 1        | 4     |          | 12 | 1        | 4     | 2        |    |          |       |          |       |          | 3       |
| 1         | 1            | 1        |       |          | 3  | 2        | 4     | 1        | 14 | 2        | 5     | 3        |    |          |       |          |       |          |         |
| 2         | 1            | 1        |       |          | 4  | 2        | 4     | 1        | 12 | 3        | 5     | 3        |    |          |       |          |       |          | 1       |
| 3         | 1            | 1        |       |          | 4  | 2        | 3     |          | 11 |          | 5     | 3        |    |          |       |          |       |          | 2       |
| 4         | 1            | 1        |       |          | 3  | 1        | 3     | 1        | 13 |          | 3     | 3        |    |          |       |          | 1     |          | 3       |
| 5         | 1            |          | 1     |          | 2  |          | 4     | 1        | 11 | 1        | 6     | 2        |    |          |       |          |       |          | 2       |
| 6         | 1            | 1        | 1     |          | 2  |          | 5     |          | 14 | 1        | 4     |          |    |          |       |          |       |          |         |
| 7         | 1            | 1        | 1     |          | 2  |          | 7     |          | 12 | 2        | 4     |          |    |          |       |          |       |          |         |
| 8         | 1            |          | 1     |          | 3  |          | 5     |          | 12 | 1        | 1     |          |    |          | 1     |          |       |          | 3       |
| 9         | 2            |          |       |          | 6  | 1        | 4     | 2        | 10 | 1        | 2     |          | 2  | 2        |       |          |       |          | 1       |
| 10        | 2            |          |       |          | 3  |          | 5     | 1        | 14 |          | 1     |          | 2  | 1        |       |          |       |          |         |
| 11.       | 1            |          |       |          | 4  |          | 3     | 2        | 13 | 2        | 2     |          | 3  | 1        | 1     |          |       |          |         |
| Noon.     | 1            |          |       |          | 3  |          | 3     | 1        | 15 | 4        | 1     |          | 3  | 2        |       | 1        |       |          |         |
| 1         | 1            |          |       |          | 3  | 2        | 2     |          | 15 | 1        |       |          | 5  | 2        | 1     |          |       |          |         |
| 2         | 2            |          |       |          | 3  |          | 4     |          | 12 | 3        | 3     |          | 3  |          |       |          |       |          |         |
| 3         | 2            |          |       |          | 2  |          | 3     |          | 13 | 1        | 5     |          | 2  |          |       |          |       |          |         |
| 4         | 2            | 1        |       |          | 4  |          | 4     |          | 11 | 1        | 4     |          | 1  |          | 1     | 2        | 2     | 2        |         |
| 5         | 2            | 1        |       |          | 2  |          | 5     | 1        | 13 |          | 2     |          | 1  |          |       | 1        | 1     | 1        |         |
| 6         | 2            |          |       |          | 1  | 1        | 6     | 1        | 13 |          | 4     |          |    |          |       | 1        | 1     |          |         |
| 7         | 2            |          |       |          |    |          | 6     | 1        | 13 | 1        | 3     |          | 2  | 2        |       |          | 1     |          |         |
| 8         | 2            | 2        |       |          |    |          | 4     |          | 14 | 1        | 3     |          | 2  | 2        |       |          | 1     |          | 1       |
| 9         | 2            | 2        |       |          | 1  |          | 6     |          | 13 | 1        | 2     |          | 2  | 2        |       |          | 1     |          |         |
| 10        | 2            | 1        |       |          | 1  |          | 6     |          | 13 |          | 2     |          | 2  | 3        |       |          |       |          |         |
| 11        | 2            |          |       |          | 1  |          | 6     | 1        | 13 |          | 2     | 2        | 3  |          |       |          |       |          |         |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1862.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.  
Height of the Cistern of the Standard Barometer above the Sea-level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 29.667                                          | 29.718                                    | 29.609  | 0.109   | 83.7                          | 87.8                                          | 79.8 | 8.0   |
| 2     | .597                                            | .652                                      | .532    | .120    | 84.6                          | 87.8                                          | 81.4 | 6.4   |
| 3     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 4     | .570                                            | .639                                      | .515    | .124    | 84.6                          | 87.8                                          | 82.8 | 5.0   |
| 5     | .575                                            | .633                                      | .514    | .119    | 84.6                          | 88.0                                          | 81.7 | 6.3   |
| 6     | .530                                            | .586                                      | .460    | .126    | 84.8                          | 88.2                                          | 82.4 | 5.8   |
| 7     | .476                                            | .525                                      | .405    | .120    | 84.3                          | 90.4                                          | 80.0 | 10.4  |
| 8     | .483                                            | .546                                      | .418    | .128    | 84.2                          | 91.0                                          | 79.8 | 11.2  |
| 9     | .489                                            | .543                                      | .417    | .126    | 83.4                          | 88.6                                          | 80.2 | 8.4   |
| 10    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 11    | .554                                            | .610                                      | .494    | .116    | 82.6                          | 87.0                                          | 80.2 | 6.8   |
| 12    | .533                                            | .583                                      | .462    | .121    | 82.7                          | 87.2                                          | 80.0 | 7.2   |
| 13    | .547                                            | .601                                      | .503    | .098    | 83.1                          | 88.0                                          | 80.0 | 8.0   |
| 14    | .556                                            | .599                                      | .495    | .104    | 82.4                          | 86.8                                          | 80.5 | 6.3   |
| 15    | .490                                            | .568                                      | .393    | .175    | 81.2                          | 89.2                                          | 80.2 | 9.0   |
| 16    | .390                                            | .453                                      | .312    | .141    | 83.1                          | 87.2                                          | 80.6 | 6.6   |
| 17    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 18    | .424                                            | .506                                      | .365    | .141    | 82.2                          | 86.4                                          | 79.8 | 6.6   |
| 19    | .508                                            | .576                                      | .460    | .116    | 83.8                          | 89.1                                          | 80.0 | 9.1   |
| 20    | .548                                            | .594                                      | .488    | .106    | 83.5                          | 87.6                                          | 79.8 | 7.8   |
| 21    | .565                                            | .624                                      | .502    | .122    | 81.5                          | 83.6                                          | 79.0 | 4.6   |
| 22    | .581                                            | .633                                      | .522    | .111    | 83.2                          | 85.0                                          | 81.8 | 3.2   |
| 23    | .562                                            | .602                                      | .513    | .089    | 83.9                          | 87.0                                          | 81.6 | 5.4   |
| 24    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 25    | .562                                            | .610                                      | .525    | .085    | 80.4                          | 83.8                                          | 78.6 | 5.2   |
| 26    | .566                                            | .622                                      | .503    | .119    | 80.3                          | 84.8                                          | 78.0 | 6.8   |
| 27    | .539                                            | .596                                      | .486    | .110    | 81.0                          | 85.4                                          | 77.0 | 8.4   |
| 28    | .515                                            | .552                                      | .467    | .085    | 81.5                          | 83.7                                          | 79.8 | 3.9   |
| 29    | .557                                            | .604                                      | .510    | .094    | 81.7                          | 85.2                                          | 79.2 | 6.0   |
| 30    | .639                                            | .704                                      | .581    | .123    | 83.5                          | 87.8                                          | 80.6 | 7.2   |
| 31    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly Observations made during the day.

# Meteorological Observations.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1862.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a Cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humi-<br>dity, complete satura-<br>tion being unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------|
| 1     | 79.9                            | 3.8                 | 78.0                | 5.7                          | 0.940                            | 10.07                                            | 2.00                                                                    | 0.83                                                                |
| 2     | 81.0                            | 3.6                 | 79.2                | 5.4                          | .976                             | .45                                              | 1.94                                                                    | .84                                                                 |
| 3     | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 4     | 81.7                            | 2.9                 | 80.2                | 4.4                          | 1.008                            | .79                                              | .60                                                                     | .87                                                                 |
| 5     | 81.5                            | 3.1                 | 79.9                | 4.7                          | 0.998                            | .67                                              | .72                                                                     | .86                                                                 |
| 6     | 81.6                            | 3.2                 | 80.0                | 4.8                          | 1.001                            | .70                                              | .76                                                                     | .86                                                                 |
| 7     | 81.3                            | 3.0                 | 79.8                | 4.5                          | 0.995                            | .64                                              | .64                                                                     | .87                                                                 |
| 8     | 80.7                            | 3.5                 | 78.9                | 5.3                          | .967                             | .37                                              | .87                                                                     | .85                                                                 |
| 9     | 80.7                            | 2.7                 | 79.3                | 4.1                          | .979                             | .51                                              | .45                                                                     | .88                                                                 |
| 10    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 11    | 79.7                            | 2.9                 | 78.2                | 4.4                          | .946                             | .17                                              | .51                                                                     | .87                                                                 |
| 12    | 79.4                            | 3.3                 | 77.7                | 5.0                          | .931                             | .00                                              | .72                                                                     | .85                                                                 |
| 13    | 80.1                            | 3.0                 | 78.6                | 4.5                          | .958                             | .28                                              | .58                                                                     | .87                                                                 |
| 14    | 80.1                            | 2.3                 | 78.9                | 3.5                          | .967                             | .39                                              | .22                                                                     | .90                                                                 |
| 15    | 80.9                            | 3.3                 | 79.2                | 5.0                          | .976                             | .45                                              | .79                                                                     | .85                                                                 |
| 16    | 80.2                            | 2.9                 | 78.7                | 4.4                          | .961                             | .33                                              | .53                                                                     | .87                                                                 |
| 17    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 18    | 79.0                            | 3.2                 | 77.4                | 4.8                          | .922                             | 9.91                                             | .63                                                                     | .86                                                                 |
| 19    | 79.2                            | 4.6                 | 76.9                | 6.9                          | .908                             | .72                                              | 2.38                                                                    | .80                                                                 |
| 20    | 79.6                            | 3.9                 | 77.6                | 5.9                          | .928                             | .95                                              | .05                                                                     | .83                                                                 |
| 21    | 79.6                            | 1.9                 | 78.6                | 2.9                          | .958                             | 10.32                                            | 0.99                                                                    | .91                                                                 |
| 22    | 80.9                            | 2.3                 | 79.7                | 3.5                          | .992                             | .63                                              | 1.26                                                                    | .89                                                                 |
| 23    | 80.9                            | 3.0                 | 79.4                | 4.5                          | .983                             | .51                                              | .62                                                                     | .87                                                                 |
| 24    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 25    | 78.5                            | 1.9                 | 77.5                | 2.9                          | .925                             | 9.98                                             | 0.96                                                                    | .91                                                                 |
| 26    | 77.6                            | 2.7                 | 76.2                | 4.1                          | .887                             | .58                                              | 1.33                                                                    | .88                                                                 |
| 27    | 78.2                            | 2.8                 | 76.8                | 4.2                          | .905                             | .75                                              | .39                                                                     | .88                                                                 |
| 28    | 79.2                            | 2.3                 | 78.0                | 3.5                          | .940                             | 10.11                                            | .20                                                                     | .89                                                                 |
| 29    | 78.8                            | 2.9                 | 77.3                | 4.4                          | .919                             | 9.90                                             | .47                                                                     | .87                                                                 |
| 30    | 80.3                            | 3.2                 | 78.7                | 4.8                          | .961                             | 10.31                                            | .69                                                                     | .86                                                                 |
| 31    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |

All the Hygrometrical elements are computed by the Greenwich Constants.

# Meteorological Observations.

xi

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1862.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>for each hour during<br>the month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Temperature<br>for each hour during<br>the month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|----------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                           | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | °                             | °                                                              | °    | °     |
| Mid-<br>night. | 29.561                                          | 29.714                                                       | 29.393  | 0.321   | 81.6                          | 84.2                                                           | 79.1 | 5.1   |
| 1              | .545                                            | .699                                                         | .385    | .314    | 81.2                          | 83.8                                                           | 77.6 | 6.2   |
| 2              | .535                                            | .680                                                         | .377    | .303    | 80.9                          | 83.7                                                           | 77.6 | 6.1   |
| 3              | .524                                            | .662                                                         | .375    | .287    | 80.8                          | 83.6                                                           | 77.0 | 6.6   |
| 4              | .520                                            | .658                                                         | .365    | .293    | 80.7                          | 83.6                                                           | 77.6 | 6.0   |
| 5              | .527                                            | .652                                                         | .371    | .281    | 80.7                          | 83.4                                                           | 78.0 | 5.4   |
| 6              | .539                                            | .667                                                         | .371    | .296    | 80.7                          | 83.6                                                           | 78.4 | 5.2   |
| 7              | .554                                            | .676                                                         | .399    | .277    | 81.2                          | 83.4                                                           | 78.8 | 4.6   |
| 8              | .566                                            | .710                                                         | .436    | .274    | 82.4                          | 84.6                                                           | 79.7 | 4.9   |
| 9              | .587                                            | .718                                                         | .445    | .273    | 83.6                          | 86.4                                                           | 80.3 | 6.1   |
| 10             | .587                                            | .713                                                         | .445    | .268    | 84.8                          | 88.0                                                           | 81.2 | 6.8   |
| 11             | .576                                            | .706                                                         | .434    | .272    | 85.3                          | 89.4                                                           | 82.0 | 7.4   |
| Noon.          | .557                                            | .692                                                         | .398    | .294    | 85.5                          | 90.0                                                           | 80.2 | 9.8   |
| 1              | .537                                            | .682                                                         | .381    | .301    | 86.0                          | 90.4                                                           | 79.0 | 11.4  |
| 2              | .517                                            | .655                                                         | .342    | .313    | 85.9                          | 90.6                                                           | 79.9 | 10.7  |
| 3              | .497                                            | .636                                                         | .327    | .309    | 85.6                          | 91.0                                                           | 78.9 | 12.1  |
| 4              | .483                                            | .613                                                         | .312    | .301    | 85.4                          | 89.4                                                           | 79.0 | 10.4  |
| 5              | .485                                            | .609                                                         | .318    | .291    | 84.7                          | 87.8                                                           | 78.7 | 9.1   |
| 6              | .498                                            | .618                                                         | .329    | .289    | 83.3                          | 85.8                                                           | 78.2 | 7.6   |
| 7              | .514                                            | .636                                                         | .337    | .299    | 82.9                          | 85.0                                                           | 78.4 | 6.6   |
| 8              | .538                                            | .673                                                         | .353    | .320    | 82.5                          | 84.6                                                           | 79.0 | 5.6   |
| 9              | .557                                            | .695                                                         | .378    | .317    | 82.3                          | 84.6                                                           | 78.8 | 5.8   |
| 10             | .566                                            | .704                                                         | .373    | .331    | 82.0                          | 84.4                                                           | 78.0 | 6.4   |
| 11             | .564                                            | .699                                                         | .366    | .333    | 81.9                          | 84.6                                                           | 78.2 | 6.4   |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers, are derived from the Observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1862.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb<br>Thermometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Va-<br>pour in a Cubic foot<br>of air. | Additional Weight of<br>Vapour required for<br>complete saturation. | Mean degree of Hu-<br>midity, complete satu-<br>ration being unity. |
|----------------|-------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
|                | °                             | °                   | °                   | °                            | Inches.                          | Troy grs.                                             | Troy grs.                                                           |                                                                     |
| Mid-<br>night. | 79.5                          | 2.1                 | 78.4                | 3.2                          | .952                             | 10.25                                                 | 1.09                                                                | 0.90                                                                |
| 1              | 79.2                          | 2.0                 | 78.2                | 3.0                          | .946                             | .19                                                   | .02                                                                 | .91                                                                 |
| 2              | 79.0                          | 1.9                 | 78.0                | 2.9                          | .940                             | .13                                                   | .097                                                                | .91                                                                 |
| 3              | 79.1                          | 1.7                 | 78.2                | 2.6                          | .946                             | .19                                                   | .88                                                                 | .92                                                                 |
| 4              | 79.0                          | 1.7                 | 78.1                | 2.6                          | .943                             | .16                                                   | .88                                                                 | .92                                                                 |
| 5              | 79.0                          | 1.7                 | 78.1                | 2.6                          | .943                             | .16                                                   | .88                                                                 | .92                                                                 |
| 6              | 79.2                          | 1.5                 | 78.4                | 2.3                          | .952                             | .27                                                   | .77                                                                 | .93                                                                 |
| 7              | 79.4                          | 1.8                 | 78.5                | 2.7                          | .955                             | .29                                                   | .92                                                                 | .92                                                                 |
| 8              | 80.0                          | 2.4                 | 78.8                | 3.6                          | .964                             | .36                                                   | 1.25                                                                | .89                                                                 |
| 9              | 80.4                          | 3.2                 | 78.8                | 4.8                          | .964                             | .34                                                   | .69                                                                 | .86                                                                 |
| 10             | 80.9                          | 3.9                 | 78.9                | 5.9                          | .967                             | .34                                                   | 2.12                                                                | .83                                                                 |
| 11             | 81.1                          | 4.2                 | 79.0                | 6.3                          | .970                             | .37                                                   | .27                                                                 | .82                                                                 |
|                |                               |                     |                     |                              |                                  |                                                       |                                                                     |                                                                     |
| Noon.          | 81.0                          | 4.5                 | 78.7                | 6.8                          | .961                             | .26                                                   | .46                                                                 | .81                                                                 |
| 1              | 81.4                          | 4.6                 | 79.1                | 6.9                          | .973                             | .38                                                   | .53                                                                 | .80                                                                 |
| 2              | 81.2                          | 4.7                 | 78.8                | 7.1                          | .964                             | .29                                                   | .58                                                                 | .80                                                                 |
| 3              | 81.1                          | 4.5                 | 78.8                | 6.8                          | .964                             | .29                                                   | .47                                                                 | .81                                                                 |
| 4              | 81.1                          | 4.3                 | 78.9                | 6.5                          | .967                             | .32                                                   | .36                                                                 | .81                                                                 |
| 5              | 80.6                          | 4.1                 | 78.5                | 6.2                          | .955                             | .23                                                   | .19                                                                 | .82                                                                 |
| 6              | 80.0                          | 3.3                 | 78.3                | 5.0                          | .949                             | .18                                                   | 1.75                                                                | .85                                                                 |
| 7              | 79.7                          | 3.2                 | 78.1                | 4.8                          | .943                             | .12                                                   | .67                                                                 | .86                                                                 |
| 8              | 79.6                          | 2.9                 | 78.1                | 4.4                          | .943                             | .14                                                   | .50                                                                 | .87                                                                 |
| 9              | 79.7                          | 2.6                 | 78.4                | 3.9                          | .952                             | .23                                                   | .35                                                                 | .88                                                                 |
| 10             | 79.7                          | 2.3                 | 78.5                | 3.5                          | .955                             | .27                                                   | .20                                                                 | .90                                                                 |
| 11             | 79.6                          | 2.3                 | 78.4                | 3.5                          | .952                             | .23                                                   | .21                                                                 | .89                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1862.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                |
|-------|-----------------------|---------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------|
|       | °                     | Inches                          |                                   |                                                                                                                           |
| 1     | 111.0                 | ...                             | S. & S. E.                        | Cloudless till 5 A. M. Scatd. ~i & ~i afterwards.                                                                         |
| 2     | ...                   | 0.08                            | S.                                | Scatd. clouds; also raining between 11 & Noon.                                                                            |
| 3     | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                           |
| 4     | ...                   | 0.21                            | S. & S. E.                        | Cloudy, with raining between Midnight & 2 A. M. & also between 9 & 11 A. M.                                               |
| 5     | ...                   | ...                             | S.                                | Cloudless till 4 A. M. cloudy afterwards; also slightly drizzling between 11 & Noon & between 8 & 9 P. M.                 |
| 6     | 122.0                 | ..                              | S. & S. E.                        | Cloudy.                                                                                                                   |
| 7     | 121.0                 | 0.42                            | S. & Calm.                        | Cloudy; also raining at 6 & 7 A. M. & between 5 & 9 P. M.                                                                 |
| 8     | 112.0                 | 1.28                            | E. & S.                           | Cloudy; also raining at 6 & 7 P. M.                                                                                       |
| 9     | ...                   | 0.75                            | N. E. & E. & Calm.                | Cloudy; also raining at 4 A. M. & also drizzling at 9 A. M. & 3 & 5 P. M.                                                 |
| 10    | ...                   | 0.45                            | <i>Sunday.</i>                    |                                                                                                                           |
| 11    | ...                   | ...                             | E.                                | Scattered ~i till 5 A. M. cloudy afterwards; also slightly raining between 11 A. M. & Noon.                               |
| 12    | ...                   | 0.17                            | E.                                | Cloudy; also raining between Midnight & 1 A. M. & also between 5 & 6 A. M.                                                |
| 13    | ...                   | ...                             | E.                                | Scatd. ~i till 4 A. M. Scatd. clouds afterwards; also slightly drizzling between 10 & 11 A. M. & at 11 P. M.              |
| 14    | ...                   | 0.33                            | E. & S. E.                        | Cloudy; also raining at 7 & 8 A. M. & between Noon & 1 & at 3 P. M.                                                       |
| 15    | 128.8                 | ...                             | E. & N. & N. E.                   | Cloudy till 5 A. M. Scatd. ~i & ~i till 4 P. M. cloudy afterwards.                                                        |
| 16    | ...                   | 0.76                            | N. E. & N. & E.                   | Scattered ~i till 3 A. M. cloudy afterwards; also raining at 6 & 9 A. M. & also between 3 & 4 P. M. & between 5 & 6 P. M. |
| 17    | ...                   | 0.58                            | <i>Sunday.</i>                    |                                                                                                                           |
| 18    | ...                   | 0.08                            | S. E. & S.                        | Cloudy till 7 P. M. cloudless afterwards; also drizzling at 8 & 9 A. M.                                                   |
| 19    | 128.2                 | ...                             | S. & S. E.                        | Cloudless till 6 A. M. Scatd. ~i & ~i till 8 P. M. cloudless afterwards; also slightly drizzling between 9 & 10 A. M.     |
| 20    | 113.5                 | ...                             | S. & S. E.                        | Cloudless till 4 A. M. cloudy till 7 P. M. cloudless afterwards; also drizzling at Midnight & between 9 & 10 A. M.        |

~i Cirri, ~i Cirro strati, ~i Cumuli, ~i Cumulo strati, ~i Nimbi, —i Strati, ~i Cirro cumuli.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1862.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                        |
|-------|-----------------------|---------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------|
|       | o                     | Inches.                         |                                   |                                                                                                   |
| 21    | ...                   | 2.13                            | S.                                | Cloudy ; also constantly raining between Midnight & 2 P. M.                                       |
| 22    | ...                   | ...                             | S. & S. W.                        | Cloudless till 5 A. M. cloudy afterwards ; also slightly drizzling at 11 A. M. & Noon.            |
| 23    | ...                   | 0.20                            | S.                                | Cloudy ; also raining between 1 & 2 P. M. & drizzling at 5 & 7 P. M.                              |
| 24    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                   |
| 25    | ...                   | 2.69                            | N. W. & S. E.                     | Cloudy ; also incessantly raining between Midnight & 5 P. M.                                      |
| 26    | ...                   | 0.79                            | S. & S. W.                        | Cloudy ; also incessantly drizzling between 3 & 11 P. M.                                          |
| 27    | ...                   | 0.25                            | S.                                | Cloudy till 7 P. M. cloudless afterwards ; also drizzling between 1 & 5 A. M. & at 10 A. M.       |
| 28    | ...                   | 0.68                            | S.                                | Cloudy ; also raining between 8 & 10 <sup>o</sup> A. M. & drizzling at 9 P. M.                    |
| 29    | ...                   | 0.11                            | S.                                | Cloudless till 6 A. M. cloudy afterwards ; also drizzling at 9 & 11 A. M. & at 3 & 4 P. M.        |
| 30    | ...                   | 0.07                            | S.                                | Scatd. clouds till 5 P. M. cloudless afterwards ; also drizzling at 6, 9, & 11 A. M. & at 1 P. M. |
| 31    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                   |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1862.*

MONTHLY RESULTS.

|                                                               |    |    | Inches |
|---------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month, ..                | .. | .. | 29.539 |
| Max. height of the Barometer occurred at 9 A. M. on the 1st,  | .. | .. | 29.718 |
| Min. height of the Barometer occurred at 4 P. M. on the 16th, | .. | .. | 29.312 |
| <i>Extreme range</i> of the Barometer during the month, ..    | .. | .. | 0.406  |
| Mean of the Daily Max. Pressures, .                           | .. | .. | 29.595 |
| Ditto ditto Min. ditto, ..                                    | .. | .. | 29.479 |
| <i>Mean daily range</i> of the Barometer during the month, .. | .. | .. | 0.116  |

|                                                                 |    |    | °    |
|-----------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month, ..                     | .. | .. | 83.0 |
| Max. Temperature occurred at 3 P. M. on the 8th,                | .. | .. | 91.0 |
| Min. Temperature occurred at 3 A. M. on the 27th,               | .. | .. | 77.0 |
| <i>Extreme range</i> of the Temperature during the month, ..    | .. | .. | 14.0 |
| Mean of the daily Max. Temperature, ..                          | .. | .. | 87.1 |
| •Ditto ditto Min. ditto, ..                                     | .. | .. | 80.2 |
| <i>Mean daily range</i> of the Temperature during the month, .. | .. | .. | 6.9  |
| Mean Wet Bulb Thermometer for the month, ..                     | .. | .. | 80.0 |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..   | .. | .. | 3.0  |
| Computed Mean Dew-point for the month, ..                       | .. | .. | 78.5 |
| Mean Dry Bulb Thermometer above computed Mean Dew-point, ..     | .. | .. | 4.5  |

|                                                |    |    | Inches |
|------------------------------------------------|----|----|--------|
| Mean Elastic force of Vapour for the month, .. | .. | .. | 0.955  |

|                                                                            |    |    | Troy grains |
|----------------------------------------------------------------------------|----|----|-------------|
| Mean Weight of Vapour for the month, ..                                    | .. | .. | 10.25       |
| Additional Weight of Vapour required for complete saturation, ..           | .. | .. | 1.57        |
| Mean degree of humidity for the month, complete saturation being unity, .. | .. | .. | 0.87        |

|                                                       |    |    | Inches  |
|-------------------------------------------------------|----|----|---------|
| Rained 25 days, Max. fall of rain during 24 hours, .. | .. | .. | 2.69    |
| Total amount of rain during the month, ..             | .. | .. | 12.03   |
| Prevailing direction of the Wind, ..                  | .. | .. | S. & E. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1862.*

## MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.        | N. | Rain on.<br>N. | E. | Rain on.<br>E. | S. | Rain on.<br>S. | W. | Rain on.<br>W. | N.W. | Rain on.<br>N.W. | Calm. | Rain on.<br>Calm. | Missed. |
|--------------|----|----------------|----|----------------|----|----------------|----|----------------|------|------------------|-------|-------------------|---------|
| No. of days. |    |                |    |                |    |                |    |                |      |                  |       |                   |         |
| Midnight.    |    |                |    |                |    |                |    |                |      |                  |       |                   |         |
| 1            | 1  | 2              | 1  | 5              | 3  | 2              | 1  | 1              |      |                  |       | 2                 | 2       |
| 2            | 1  | 2              | 1  | 4              | 1  | 3              | 1  | 1              |      |                  |       | 2                 | 1       |
| 3            | 2  | 1              |    | 3              | 4  | 1              | 1  | 1              |      |                  |       | 2                 | 2       |
| 4            | 2  |                |    | 5              | 1  | 3              | 1  | 1              |      |                  |       | 1                 | 3       |
| 5            | 3  |                |    | 5              | 2  | 1              | 1  | 1              | 1    |                  |       |                   | 1       |
| 6            | 3  | 1              | 1  | 4              | 1  | 2              | 1  | 2              | 1    |                  |       | 1                 |         |
| 7            | 1  | 1              |    | 3              | 1  | 5              | 1  | 1              | 2    |                  |       | 1                 |         |
| 8            | 1  | 2              |    | 4              | 1  | 3              | 1  | 8              | 3    |                  |       | 1                 | 5       |
| 9            | 1  | 5              | 2  | 1              | 6  | 1              | 10 | 5              | 2    |                  |       | 1                 |         |
| 10           | 2  | 3              |    | 2              | 4  | 1              | 11 | 3              | 3    |                  |       | 1                 |         |
| 11           |    | 5              |    | 1              | 1  | 4              | 12 | 4              | 4    |                  |       |                   |         |
| Noon.        |    |                |    |                |    |                |    |                |      |                  |       |                   |         |
| 1            |    | 2              |    | 3              | 1  | 3              | 12 | 2              | 3    | 2                | 3     | 1                 |         |
| 2            |    | 3              |    | 4              | 2  | 1              | 10 | 2              | 3    | 1                | 3     |                   |         |
| 3            |    | 2              |    | 6              |    | 1              | 12 | 2              | 3    | 1                | 1     | 1                 |         |
| 4            | 2  | 1              |    | 6              | 1  | 2              | 13 | 2              | 2    |                  |       |                   |         |
| 5            |    | 2              | 1  | 5              | 3  |                | 12 | 2              | 3    |                  |       |                   |         |
| 6            | 1  | 3              | 1  | 3              | 4  |                | 9  |                | 1    |                  | 1     | 2                 | 1       |
| 7            |    | 2              | 1  | 6              | 1  | 5              | 1  | 11             | 1    |                  | 1     | 1                 |         |
| 8            |    | 1              |    | 7              | 1  | 4              | 12 | 3              |      |                  | 1     |                   |         |
| 9            |    | 1              |    | 6              | 5  |                | 12 | 1              |      |                  | 1     | 1                 |         |
| 10           |    |                |    | 7              | 5  |                | 12 | 3              |      |                  | 1     | 1                 |         |
| 11           |    |                |    | 7              | 6  |                | 11 |                |      | 1                |       |                   |         |
|              |    |                |    | 7              | 1  | 6              | 11 | 1              |      | 1                |       |                   |         |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of September, 1862.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.

Height of the Cistern of the Standard Barometer above the Sea-level, 18.11.

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 29.672                                          | 29.740                                    | 29.615  | .125    | 83.8                          | 88.6                                          | 80.3 | 8.6   |
| 2     | .699                                            | .748                                      | .641    | .107    | 83.0                          | 88.1                                          | 80.4 | 7.7   |
| 3     | .724                                            | .772                                      | .666    | .106    | 82.6                          | 88.6                                          | 80.0 | 8.6   |
| 4     | .731                                            | .779                                      | .679    | .100    | 82.7                          | 88.0                                          | 79.6 | 8.4   |
| 5     | .770                                            | .824                                      | .710    | .114    | 82.4                          | 88.4                                          | 80.2 | 8.2   |
| 6     | .796                                            | .851                                      | .710    | .141    | 81.8                          | 86.8                                          | 80.4 | 6.4   |
| 7     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 8     | .725                                            | .809                                      | .625    | .184    | 85.1                          | 90.4                                          | 80.2 | 10.2  |
| 9     | .694                                            | .763                                      | .623    | .140    | 84.6                          | 89.4                                          | 81.4 | 8.0   |
| 10    | .655                                            | .726                                      | .568    | .158    | 85.7                          | 91.5                                          | 81.3 | 10.2  |
| 11    | .642                                            | .690                                      | .577    | .113    | 84.6                          | 90.8                                          | 80.1 | 10.7  |
| 12    | .656                                            | .707                                      | .617    | .090    | 82.7                          | 85.2                                          | 80.8 | 4.4   |
| 13    | .707                                            | .768                                      | .658    | .110    | 82.7                          | 88.2                                          | 80.2 | 8.0   |
| 14    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 15    | .700                                            | .768                                      | .625    | .143    | 83.9                          | 89.8                                          | 81.0 | 8.8   |
| 16    | .731                                            | .782                                      | .682    | .100    | 82.3                          | 86.8                                          | 79.9 | 6.9   |
| 17    | .724                                            | .786                                      | .655    | .131    | 80.1                          | 85.0                                          | 78.8 | 6.2   |
| 18    | .713                                            | .767                                      | .661    | .106    | 79.5                          | 84.8                                          | 77.8 | 7.0   |
| 19    | .746                                            | .796                                      | .701    | .095    | 79.7                          | 83.7                                          | 76.2 | 7.5   |
| 20    | .787                                            | .854                                      | .731    | .123    | 81.4                          | 86.6                                          | 78.6 | 8.0   |
| 21    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 22    | .811                                            | .880                                      | .739    | .141    | 84.7                          | 89.7                                          | 80.2 | 9.5   |
| 23    | .723                                            | .792                                      | .632    | .160    | 85.0                          | 92.2                                          | 81.4 | 10.8  |
| 24    | .622                                            | .694                                      | .537    | .157    | 84.4                          | 91.1                                          | 82.0 | 9.1   |
| 25    | .576                                            | .640                                      | .491    | .149    | 84.5                          | 91.0                                          | 81.2 | 9.8   |
| 26    | .577                                            | .629                                      | .528    | .101    | 81.2                          | 87.3                                          | 79.2 | 8.1   |
| 27    | .615                                            | .683                                      | .545    | .138    | 79.4                          | 81.4                                          | 77.8 | 3.6   |
| 28    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 29    | .783                                            | .854                                      | .720    | .134    | 80.7                          | 84.6                                          | 78.0 | 6.6   |
| 30    | .739                                            | .826                                      | .649    | .177    | 83.6                          | 89.0                                          | 79.6 | 9.4   |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly Observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of September, 1862.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Thermo-<br>meter. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a Cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humidity,<br>complete saturation be-<br>ing unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|
|       | °                               | °                   | °                   | °                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                   |
| 1     | 79.8                            | 4.0                 | 77.8                | 6.0                          | .934                             | 10.01                                            | 2.09                                                                    | .83                                                               |
| 2     | 79.6                            | 3.4                 | 77.9                | 5.1                          | .937                             | .06                                              | 1.76                                                                    | .85                                                               |
| 3     | 79.7                            | 2.9                 | 78.2                | 4.4                          | .946                             | .17                                              | .51                                                                     | .87                                                               |
| 4     | 79.5                            | 3.2                 | 77.9                | 4.8                          | .937                             | .06                                              | .66                                                                     | .86                                                               |
| 5     | 79.6                            | 2.8                 | 78.2                | 4.2                          | .946                             | .17                                              | .44                                                                     | .88                                                               |
| 6     | 79.1                            | 2.7                 | 77.7                | 4.1                          | .931                             | .02                                              | .38                                                                     | .88                                                               |
| 7     | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 8     | 80.4                            | 4.7                 | 78.0                | 7.1                          | .940                             | .05                                              | 2.52                                                                    | .80                                                               |
| 9     | 80.7                            | 3.9                 | 78.7                | 5.9                          | .961                             | .29                                              | .10                                                                     | .83                                                               |
| 10    | 81.2                            | 4.5                 | 78.9                | 6.8                          | .967                             | .32                                              | .48                                                                     | .81                                                               |
| 11    | 80.8                            | 3.8                 | 78.9                | 5.7                          | .967                             | .34                                              | .05                                                                     | .84                                                               |
| 12    | 80.3                            | 2.4                 | 79.1                | 3.6                          | .973                             | .45                                              | 1.27                                                                    | .89                                                               |
| 13    | 79.9                            | 2.8                 | 78.5                | 4.2                          | .955                             | .27                                              | .45                                                                     | .88                                                               |
| 14    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 15    | 80.4                            | 3.5                 | 78.6                | 5.3                          | .958                             | .28                                              | .85                                                                     | .85                                                               |
| 16    | 79.3                            | 3.0                 | 77.8                | 4.5                          | .934                             | .03                                              | .55                                                                     | .87                                                               |
| 17    | 78.1                            | 2.0                 | 77.1                | 3.0                          | .913                             | 9.86                                             | 0.98                                                                    | .91                                                               |
| 18    | 77.6                            | 1.9                 | 76.6                | 2.9                          | .899                             | .71                                              | .95                                                                     | .91                                                               |
| 19    | 77.7                            | 2.0                 | 76.7                | 3.0                          | .902                             | .74                                              | .98                                                                     | .91                                                               |
| 20    | 78.7                            | 2.7                 | 77.3                | 4.1                          | .919                             | .90                                              | 1.37                                                                    | .88                                                               |
| 21    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 22    | 80.4                            | 4.3                 | 78.2                | 6.5                          | .946                             | 10.11                                            | 2.31                                                                    | .81                                                               |
| 23    | 81.1                            | 3.9                 | 79.1                | 5.9                          | .973                             | .40                                              | .13                                                                     | .83                                                               |
| 24    | 81.0                            | 3.4                 | 79.3                | 5.1                          | .979                             | .48                                              | 1.83                                                                    | .85                                                               |
| 25    | 80.9                            | 3.6                 | 79.1                | 5.4                          | .973                             | .42                                              | .93                                                                     | .84                                                               |
| 26    | 78.7                            | 2.5                 | 77.4                | 3.8                          | .922                             | 9.93                                             | .28                                                                     | .89                                                               |
| 27    | 77.3                            | 2.1                 | 76.2                | 3.2                          | .887                             | .60                                              | .02                                                                     | .90                                                               |
| 28    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 29    | 78.5                            | 2.2                 | 77.4                | 3.3                          | .922                             | 9.95                                             | .09                                                                     | .90                                                               |
| 30    | 80.2                            | 3.1                 | 78.5                | 5.1                          | .955                             | 10.25                                            | .78                                                                     | .85                                                               |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of September, 1862.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer for<br>each hour during the<br>month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture for each hour<br>during the<br>month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|---------------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                                | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                                   | o    | o     |
| Mid-<br>night. | 29.717                                          | 29.840                                                       | 29.563  | 0.277   | 81.2                          | 83.8                                                                | 78.4 | 5.4   |
| 1              | .703                                            | .837                                                         | .560    | .277    | 80.9                          | 83.8                                                                | 78.4 | 5.4   |
| 2              | .695                                            | .824                                                         | .554    | .270    | 80.7                          | 83.4                                                                | 78.2 | 5.2   |
| 3              | .685                                            | .821                                                         | .545    | .276    | 80.5                          | 83.2                                                                | 77.8 | 5.4   |
| 4              | .678                                            | .791                                                         | .548    | .243    | 80.3                          | 83.0                                                                | 76.6 | 6.4   |
| 5              | .698                                            | .841                                                         | .561    | .280    | 80.3                          | 83.0                                                                | 76.4 | 6.6   |
| 6              | .716                                            | .847                                                         | .595    | .252    | 80.1                          | 82.8                                                                | 76.2 | 6.6   |
| 7              | .732                                            | .856                                                         | .604    | .252    | 80.8                          | 84.0                                                                | 77.2 | 6.8   |
| 8              | .751                                            | .873                                                         | .615    | .258    | 82.4                          | 85.4                                                                | 78.5 | 6.9   |
| 9              | .763                                            | .878                                                         | .629    | .249    | 83.8                          | 86.8                                                                | 78.8 | 8.0   |
| 10             | .760                                            | .880                                                         | .625    | .255    | 84.9                          | 88.0                                                                | 79.8 | 8.2   |
| 11             | .749                                            | .851                                                         | .605    | .246    | 86.0                          | 90.4                                                                | 77.8 | 12.6  |
| Noon.          | .728                                            | .830                                                         | .582    | .248    | 86.3                          | 90.8                                                                | 77.8 | 13.0  |
| 1              | .699                                            | .805                                                         | .549    | .256    | 86.4                          | 91.1                                                                | 78.0 | 13.1  |
| 2              | .671                                            | .782                                                         | .522    | .260    | 85.4                          | 91.8                                                                | 78.4 | 13.4  |
| 3              | .653                                            | .758                                                         | .510    | .248    | 85.1                          | 92.2                                                                | 77.8 | 14.4  |
| 4              | .647                                            | .747                                                         | .491    | .256    | 84.8                          | 91.8                                                                | 78.4 | 13.4  |
| 5              | .647                                            | .751                                                         | .492    | .259    | 83.8                          | 90.0                                                                | 79.0 | 11.0  |
| 6              | .658                                            | .757                                                         | .514    | .243    | 82.9                          | 88.4                                                                | 78.6 | 9.8   |
| 7              | .678                                            | .781                                                         | .538    | .243    | 82.5                          | 86.8                                                                | 77.8 | 9.0   |
| 8              | .703                                            | .808                                                         | .581    | .227    | 82.1                          | 86.0                                                                | 77.8 | 8.2   |
| 9              | .720                                            | .830                                                         | .591    | .239    | 81.8                          | 85.8                                                                | 78.4 | 7.4   |
| 10             | .725                                            | .833                                                         | .581    | .252    | 81.5                          | 85.2                                                                | 78.2 | 7.0   |
| 11             | .728                                            | .826                                                         | .602    | .224    | 81.2                          | 84.4                                                                | 78.6 | 5.8   |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the Observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of September, 1862.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force<br>of Vapour. | Mean Weight of Va-<br>pour in a Cubic<br>foot of air. | Additional Weight of<br>Vapour required<br>for complete satu-<br>ration. | Mean degree of Hu-<br>midity, complete<br>saturation being<br>unity. |
|----------------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------|
|                | °                               | °                   | °                   | °                            | Inches.                          | Troy grs.                                             | Troy grs.                                                                |                                                                      |
| Mid-<br>night. | 79.1                            | 2.1                 | 78.0                | 3.2                          | 0.940                            | 10.13                                                 | 1.08                                                                     | 0.90                                                                 |
| 1              | 79.0                            | 1.9                 | 78.0                | 2.9                          | .940                             | .13                                                   | 0.97                                                                     | .91                                                                  |
| 2              | 78.9                            | 1.8                 | 78.0                | 2.7                          | .940                             | .13                                                   | .91                                                                      | .92                                                                  |
| 3              | 78.8                            | 1.7                 | 77.9                | 2.6                          | .937                             | .10                                                   | .88                                                                      | .92                                                                  |
| 4              | 78.5                            | 1.8                 | 77.6                | 2.7                          | .928                             | .01                                                   | .90                                                                      | .92                                                                  |
| 5              | 78.7                            | 1.6                 | 77.9                | 2.4                          | .937                             | .12                                                   | .79                                                                      | .93                                                                  |
| 6              | 78.6                            | 1.5                 | 77.8                | 2.3                          | .934                             | .09                                                   | .75                                                                      | .93                                                                  |
| 7              | 79.1                            | 1.7                 | 78.2                | 2.6                          | .946                             | .19                                                   | .88                                                                      | .92                                                                  |
| 8              | 79.8                            | 2.6                 | 78.5                | 3.9                          | .955                             | .27                                                   | 1.34                                                                     | .89                                                                  |
| 9              | 80.2                            | 3.6                 | 78.4                | 5.4                          | .952                             | .21                                                   | .89                                                                      | .84                                                                  |
| 10             | 80.6                            | 4.3                 | 78.4                | 6.5                          | .952                             | .17                                                   | 2.32                                                                     | .81                                                                  |
| 11             | 80.8                            | 5.2                 | 78.2                | 7.8                          | .946                             | .09                                                   | .82                                                                      | .78                                                                  |
| Noon.          | 80.8                            | 5.5                 | 78.0                | 8.3                          | .940                             | .03                                                   | .99                                                                      | .77                                                                  |
| 1              | 80.9                            | 5.5                 | 78.1                | 8.3                          | .943                             | .06                                                   | 3.00                                                                     | .77                                                                  |
| 2              | 80.5                            | 4.9                 | 78.0                | 7.4                          | .940                             | .05                                                   | 2.63                                                                     | .79                                                                  |
| 3              | 80.2                            | 4.9                 | 77.7                | 7.4                          | .931                             | 9.96                                                  | .61                                                                      | .79                                                                  |
| 4              | 80.1                            | 4.7                 | 77.7                | 7.1                          | .931                             | .96                                                   | .50                                                                      | .80                                                                  |
| 5              | 79.7                            | 4.1                 | 77.6                | 6.2                          | .928                             | .95                                                   | .15                                                                      | .82                                                                  |
| 6              | 79.6                            | 3.3                 | 77.9                | 5.0                          | .937                             | 10.06                                                 | 1.73                                                                     | .85                                                                  |
| 7              | 79.7                            | 2.8                 | 78.3                | 4.2                          | .949                             | .20                                                   | .44                                                                      | .88                                                                  |
| 8              | 79.6                            | 2.5                 | 78.3                | 3.8                          | .949                             | .20                                                   | .31                                                                      | .89                                                                  |
| 9              | 79.5                            | 2.3                 | 78.3                | 3.5                          | .949                             | .20                                                   | .20                                                                      | .90                                                                  |
| 10             | 79.2                            | 2.3                 | 78.0                | 3.5                          | .940                             | .11                                                   | .20                                                                      | .89                                                                  |
| 11             | 79.0                            | 2.2                 | 77.9                | 3.3                          | .937                             | .10                                                   | .11                                                                      | .90                                                                  |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of September, 1862.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                  |
|-------|-----------------------|---------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
|       | °                     | Inches                          |                                   |                                                                                                                             |
| 1     | ...                   | ...                             | S. E. & S.                        | Cloudless till 6 A. M. Scatd. clouds afterwards; also slightly drizzling between 1 & 2 P. M.                                |
| 2     | 122.0                 | ...                             | S.                                | Cloudless till 4 A. M. Scatd. clouds afterwards; also slightly drizzling between 5 & 6 P. M.                                |
| 3     | 119.6                 | 0.23                            | S. E. & S.                        | Cloudless till 5 A. M. Scatd. ☾ till 1 P. M. cloudy afterwards; also raining between 1 & 2 P. M.                            |
| 4     | ...                   | 0.29                            | S. & S. E.                        | Scatd. ☾ & ☾ till 10 A. M. cloudy afterwards; also raining at 3 P. M.                                                       |
| 5     | ...                   | 0.44                            | E. & S.                           | Scatd. ☾ & ☾ till 3 A. M. cloudy afterwards; also raining at 1 & 3 P. M.                                                    |
| 6     | ...                   | ...                             | S. & S. E. & S. W.                | Cloudy.                                                                                                                     |
| 7     | ...                   | ...                             | Sunday.                           |                                                                                                                             |
| 8     | 130.0                 | ...                             | S.                                | Scatd. ☾ & ☾; also very slightly drizzling between 7 & 8 P. M.                                                              |
| 9     | 120.0                 | ...                             | S.                                | Scatd. ☾ till 10 A. M. Scatd. clouds till 7 P. M. cloudless afterwards.                                                     |
| 10    | 135.0                 | ...                             | S. W. & S.                        | Cloudless till 7 A. M. Scatd. ☾ & ☾ till 6 P. M. cloudless afterwards; also slightly raining at 1 P. M.                     |
| 11    | 124.0                 | 1.35                            | Calm & S. E.                      | Cloudy; also raining between 4 & 6 P. M.                                                                                    |
| 12    | ...                   | ...                             | S. & S. E.                        | Cloudy; also very slightly drizzling at 11 A. M.                                                                            |
| 13    | ...                   | 0.63                            | S.                                | Cloudy; also raining at 8 A. M. and also between 1 & 6 P. M.                                                                |
| 14    | ...                   | 0.09                            | Sunday.                           |                                                                                                                             |
| 15    | 130.5                 | 0.78                            | S. & E.                           | Cloudless till 7 A. M. Scatd. ☾ & ☾ till 6 P. M. cloudless afterwards; also raining between 1 & 3 P. M.                     |
| 16    | 126.4                 | ...                             | S. E.                             | Cloudless till 2 A. M. Scatd. clouds afterwards; also slightly drizzling between 10 & 11 A. M. and also between 8 & 9 P. M. |
| 17    | ...                   | 0.22                            | S. E. & S.                        | Cloudless till 4 A. M. cloudy afterwards; also raining between 8 & 9 A. M. and also between 11 A. M. & 1 P. M.              |
| 18    | ...                   | 0.82                            | S. & S. E. & E.                   | Cloudy; also raining at 6 A. M. Noon 4, 7, & 8 P. M.                                                                        |
| 19    | ...                   | 1.25                            | S. E. & Calm.                     | Cloudy; also constantly raining.                                                                                            |

☾ Cirri, ☾ Cirro strati, ☾ Cumuli, ☾ Cumulo strati, ☾ Nimbi, — Strati,  
☾ Cirro cumuli.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of September, 1862.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                            |
|-------|-----------------------|---------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------|
| 20    | ...                   | 0.26                            | S. E.                             | Cloudless till 5 A. M. cloudy till 3 P. M. Scatd. \i afterwards; also raining at 9 A. M. and at Noon. |
| 21    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                       |
| 22    | 135.0                 | ...                             | S. & S. W.                        | Cloudless till 6 A. M. Scatd. \i till 3 P. M. Scatd. \i till 7 P. M. cloudless afterwards.            |
| 23    | 134.0                 | 0.30                            | Variable.                         | Cloudless till 4 A. M. Scatd. clouds till 6 P. M. cloudless afterwards; also raining at 5 P. M.       |
| 24    | 136.2                 | 0.29                            | S. E. & S.                        | Scatd. \i & \i till Noon, cloudy afterwards; also raining at 1 P. M.                                  |
| 25    | 135.0                 | 0.24                            | N. E. & S. E.                     | Scatd. \i & \i; also raining at 1 & 3 P. M.                                                           |
| 26    | 132.0                 | 3.24                            | N. E. & N. W.                     | Cloudy till 7 P. M. cloudless afterwards; also raining between 3 & 7 A. M. & also between 2 & 6 P. M. |
| 27    | ...                   | 0.71                            | N. E. & E.                        | Cloudy; also incessantly raining between 9 A. M. & 9 P. M.                                            |
| 28    | ...                   | 0.22                            | <i>Sunday.</i>                    |                                                                                                       |
| 29    | ...                   | ...                             | E. & S. E.                        | Cloudless till 3 A. M. cloudy afterwards.                                                             |
| 30    | ...                   | ...                             | S. & W.                           | Cloudy till 2 P. M. Scatd. \i & \i afterwards; also drizzling at 2 A. M.                              |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of September, 1862.*

MONTHLY RESULTS.

|                                                                |    |    | Inches |
|----------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month,                    | .. | .. | 29.704 |
| Max. height of the Barometer occurred at 10 A. M. on the 22nd, | .. | .. | 29.880 |
| Min. height of the Barometer occurred at 4 P. M. on the 25th,  | .. | .. | 29.491 |
| Extreme range of the Barometer during the month,               | .. | .. | 0.389  |
| Mean of the daily Max. Pressures,                              | .. | .. | 29.766 |
| Ditto ditto Min. ditto,                                        | .. | .. | 29.638 |
| Mean daily range of the Barometer during the month,            | .. | .. | 0.128  |

|                                                       |    |    | °    |
|-------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,              | .. | .. | 82.8 |
| Max. Temperature occurred at 3 P. M. on the 23rd,     | .. | .. | 92.2 |
| Min. Temperature occurred at 6 A. M. on the 19th,     | .. | .. | 76.2 |
| Extreme range of the Temperature during the month,    | .. | .. | 16.0 |
| Mean of the daily Max. Temperature,                   | .. | .. | 88.0 |
| Ditto ditto Min. ditto,                               | .. | .. | 79.9 |
| Mean daily range of the Temperature during the month, | .. | .. | 8.1  |

|                                                               |    |    | °      |
|---------------------------------------------------------------|----|----|--------|
| Mean Wet Bulb Thermometer for the month,                      | .. | .. | 79.6   |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, .. |    |    | 3.2    |
| Computed Mean Dew-point for the month,                        | .. | .. | 78.0   |
| Mean Dry Bulb Thermometer above computed Mean Dew-point, ..   |    |    | 4.8    |
|                                                               |    |    | Inches |
| Mean Elastic force of Vapour for the month, ..                | .. | .. | 0.940  |

|                                                                         |    |    | Troy grains |
|-------------------------------------------------------------------------|----|----|-------------|
| Mean Weight of Vapour for the month, ..                                 | .. | .. | 10.09       |
| Additional Weight of Vapour required for complete saturation, ..        |    |    | 1.66        |
| Mean degree of humidity for the month, complete saturation being unity, |    |    | 0.86        |

|                                                       |    |    | Inches     |
|-------------------------------------------------------|----|----|------------|
| Rained 24 days, Max. fall of rain during 24 hours, .. | .. | .. | 3.24       |
| Total amount of rain during the month, ..             | .. | .. | 10.86      |
| Prevailing direction of the Wind, ..                  | .. | .. | S. & S. E. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of September, 1862.*

### MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

| Date.     | N. | Rain on. | N. E. | Rain on. | E. | Rain on.     | S. E. | Rain on. | S. | Rain on. | S. W. | Rain on. | W. | Rain on. | N. W. | Rain on. | Calm. | Rain on. | Missed. |
|-----------|----|----------|-------|----------|----|--------------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|-------|----------|---------|
|           |    |          |       |          |    | No. of days. |       |          |    |          |       |          |    |          |       |          |       |          |         |
| Midnight. | 1  |          | 1     |          |    |              |       | 9        |    | 12       |       |          |    |          |       |          |       | 2        | 1       |
| 1         |    |          | 1     |          |    |              |       | 10       | 1  | 13       |       |          |    |          |       |          |       | 2        |         |
| 2         |    |          |       |          | 3  |              |       | 8        | 2  | 13       |       |          |    |          |       |          |       | 2        |         |
| 3         |    |          |       |          | 3  |              |       | 7        | 1  | 13       |       |          |    |          |       |          |       | 1        | 4       |
| 4         |    |          |       |          | 3  |              |       | 5        | 1  | 12       |       |          |    |          | 1     | 1        | 1     | 1        | 2       |
| 5         |    |          |       |          | 4  |              |       | 6        | 1  | 11       | 1     |          |    |          | 1     | 1        | 1     | 1        |         |
| 6         |    |          | 3     |          | 5  |              |       | 2        |    | 13       | 1     |          |    |          | 1     | 1        | 1     | 1        |         |
| 7         | 3  |          | 2     |          | 4  |              |       | 3        |    | 11       | 1     |          |    |          | 1     | 1        | 1     | 1        |         |
| 8         | 2  |          | 2     |          | 3  |              |       | 4        | 1  | 8        | 1     |          |    |          | 2     |          |       |          | 4       |
| 9         | 2  | 1        | 2     |          | 4  | 1            |       | 5        | 1  | 8        |       | 2        |    |          |       | 1        |       |          |         |
| 10        | 1  |          | 2     | 1        | 5  |              |       | 4        |    | 11       |       |          |    |          | 2     | 3        |       |          |         |
| 11        | 1  |          | 2     | 1        | 2  | 1            |       | 8        | 1  | 10       | 1     |          |    |          | 2     | 1        |       |          |         |
| Noon.     |    |          |       |          |    |              |       |          |    |          |       |          |    |          |       |          |       |          |         |
| 1         | 1  | 1        | 4     | 1        | 2  |              | 7     | 1        | 7  | 2        | 2     | 3        | 1  | 3        | 1     | 2        | 1     |          |         |
| 2         |    |          | 3     | 1        | 3  | 1            | 8     | 1        | 5  | 1        | 3     | 5        |    | 2        | 2     |          |       |          |         |
| 3         | 1  | 1        | 3     | 3        | 1  | 1            | 5     | 1        | 9  | 2        | 5     | 2        |    | 2        | 1     |          |       |          |         |
| 4         |    |          | 3     | 3        | 2  |              | 4     |          | 9  | 2        | 2     | 2        |    | 2        |       |          |       |          |         |
| 5         | 1  | 1        | 3     | 3        | 2  |              | 8     |          | 8  | 2        | 1     | 2        |    | 1        |       |          |       |          |         |
| 6         | 2  |          | 3     | 2        | 1  |              | 9     | 1        | 7  | 1        | 2     | 1        |    | 2        | 1     |          |       |          |         |
| 7         | 2  |          | 2     | 1        | 1  |              | 8     | 1        | 8  | 1        | 1     | 2        |    | 1        |       |          |       |          |         |
| 8         | 1  |          | 3     | 1        | 2  |              | 8     | 1        | 6  | 1        |       | 2        |    | 2        |       |          |       |          |         |
| 9         | 1  |          | 3     | 2        | 3  |              | 7     |          | 7  |          | 2     | 2        |    | 2        |       |          |       |          |         |
| 10        | 1  |          | 1     |          | 4  |              | 8     |          | 8  |          | 2     | 2        |    | 2        |       |          |       |          |         |
| 11        | 1  |          | 1     |          | 3  |              | 8     |          | 7  |          | 2     | 2        |    | 2        |       |          |       |          |         |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of October, 1862.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.

Height of the Cistern of the Standard Barometer above the Sea-level, 18.11.

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fah. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                        | Inches.                                   | Inches. | Inches. | o                             | o                                             | o    | o     |
| 1     | 29.648                                         | 29.710                                    | 29.570  | 0.140   | 85.6                          | 90.9                                          | 81.2 | 9.7   |
| 2     | .627                                           | .689                                      | .572    | .117    | 85.9                          | 90.8                                          | 82.2 | 8.6   |
| 3     | .674                                           | .758                                      | .623    | .135    | 84.0                          | 89.9                                          | 81.0 | 8.9   |
| 4     | .641                                           | .735                                      | .572    | .163    | 79.1                          | 83.0                                          | 75.0 | 8.0   |
| 5     | Sunday.                                        |                                           |         |         |                               |                                               |      |       |
| 6     | .608                                           | .683                                      | .558    | .125    | 80.3                          | 84.6                                          | 77.0 | 7.6   |
| 7     | .709                                           | .773                                      | .649    | .124    | 81.6                          | 86.8                                          | 79.9 | 6.9   |
| 8     | .777                                           | .841                                      | .713    | .128    | 83.2                          | 88.6                                          | 79.0 | 9.6   |
| 9     | .778                                           | .845                                      | .697    | .148    | 83.6                          | 90.0                                          | 79.6 | 10.4  |
| 10    | .755                                           | .822                                      | .694    | .128    | 81.8                          | 86.5                                          | 78.6 | 7.9   |
| 11    | .763                                           | .830                                      | .708    | .122    | 80.9                          | 87.8                                          | 77.0 | 10.8  |
| 12    | Sunday.                                        |                                           |         |         |                               |                                               |      |       |
| 13    | .799                                           | .866                                      | .725    | .141    | 82.7                          | 88.6                                          | 78.8 | 9.8   |
| 14    | .792                                           | .845                                      | .723    | .122    | 82.0                          | 88.3                                          | 80.2 | 8.1   |
| 15    | .755                                           | .845                                      | .702    | .143    | 81.4                          | 85.3                                          | 79.0 | 6.3   |
| 16    | .767                                           | .835                                      | .711    | .124    | 81.9                          | 87.8                                          | 78.0 | 9.8   |
| 17    | .798                                           | .868                                      | .734    | .134    | 83.3                          | 89.2                                          | 78.8 | 10.4  |
| 18    | .817                                           | .893                                      | .752    | .141    | 82.5                          | 86.8                                          | 78.5 | 8.3   |
| 19    | Sunday.                                        |                                           |         |         |                               |                                               |      |       |
| 20    | .864                                           | .923                                      | .801    | .122    | 83.3                          | 88.8                                          | 78.9 | 9.9   |
| 21    | .860                                           | .917                                      | .801    | .116    | 80.3                          | 86.4                                          | 77.5 | 8.9   |
| 22    | .792                                           | .864                                      | .742    | .122    | 76.7                          | 80.5                                          | 75.2 | 5.3   |
| 23    | .636                                           | .738                                      | .535    | .203    | 76.2                          | 77.7                                          | 74.6 | 3.1   |
| 24    | .563                                           | .669                                      | .481    | .188    | 77.2                          | 80.3                                          | 74.8 | 5.5   |
| 25    | .733                                           | .799                                      | .662    | .137    | 77.3                          | 82.2                                          | 72.8 | 9.4   |
| 26    | Sunday.                                        |                                           |         |         |                               |                                               |      |       |
| 27    | .809                                           | .863                                      | .749    | .114    | 80.2                          | 86.3                                          | 74.8 | 11.5  |
| 28    | .869                                           | .928                                      | .807    | .121    | 79.4                          | 86.0                                          | 74.4 | 11.6  |
| 29    | .936                                           | .986                                      | .884    | .102    | 77.8                          | 84.2                                          | 72.0 | 12.2  |
| 30    | .959                                           | 30.033                                    | .903    | .130    | 77.6                          | 83.7                                          | 70.9 | 12.8  |
| 31    | .972                                           | .037                                      | .929    | .108    | 79.6                          | 84.9                                          | 75.0 | 9.9   |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly Observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of October, 1862.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Date. | Mean Wet Bulb Thermo-<br>meter. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a Cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humidity,<br>complete saturation be-<br>ing unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|
|       | °                               | °                   | °                   | °                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                   |
| 1     | 81.5                            | 4.1                 | 79.4                | 6.2                          | 0.983                            | 10.49                                            | 2.27                                                                    | 0.82                                                              |
| 2     | 81.5                            | 4.4                 | 79.3                | 6.6                          | .979                             | .44                                              | .43                                                                     | .81                                                               |
| 3     | 80.7                            | 3.3                 | 79.0                | 5.0                          | .970                             | .40                                              | 1.77                                                                    | .86                                                               |
| 4     | 77.2                            | 1.9                 | 76.2                | 2.9                          | .887                             | 9.60                                             | 0.93                                                                    | .91                                                               |
| 5     | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 6     | 77.8                            | 2.5                 | 76.5                | 3.8                          | .896                             | .67                                              | 1.24                                                                    | .89                                                               |
| 7     | 79.4                            | 2.2                 | 78.3                | 3.3                          | .919                             | 10.22                                            | .12                                                                     | .90                                                               |
| 8     | 80.4                            | 2.8                 | 79.0                | 4.2                          | .970                             | .42                                              | .47                                                                     | .88                                                               |
| 9     | 79.5                            | 4.1                 | 77.4                | 6.2                          | .922                             | 9.89                                             | 2.14                                                                    | .82                                                               |
| 10    | 78.7                            | 3.1                 | 77.1                | 4.7                          | .913                             | .82                                              | 1.58                                                                    | .86                                                               |
| 11    | 78.1                            | 2.8                 | 76.7                | 4.2                          | .902                             | .72                                              | .38                                                                     | .88                                                               |
| 12    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 13    | 79.6                            | 3.1                 | 78.0                | 4.7                          | .940                             | 10.09                                            | .63                                                                     | .86                                                               |
| 14    | 79.3                            | 2.7                 | 77.9                | 4.1                          | .937                             | .08                                              | .39                                                                     | .88                                                               |
| 15    | 78.2                            | 3.2                 | 76.6                | 4.8                          | .899                             | 9.67                                             | .60                                                                     | .86                                                               |
| 16    | 78.3                            | 3.6                 | 76.5                | 5.4                          | .896                             | .65                                              | .79                                                                     | .84                                                               |
| 17    | 78.8                            | 4.5                 | 76.5                | 6.8                          | .896                             | .61                                              | 2.32                                                                    | .81                                                               |
| 18    | 78.4                            | 4.1                 | 76.3                | 6.2                          | .890                             | .57                                              | .07                                                                     | .82                                                               |
| 19    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 20    | 78.2                            | 5.1                 | 75.6                | 7.7                          | .871                             | .33                                              | .60                                                                     | .78                                                               |
| 21    | 77.3                            | 3.0                 | 75.8                | 4.5                          | .876                             | .44                                              | 1.47                                                                    | .87                                                               |
| 22    | 75.0                            | 1.7                 | 74.1                | 2.6                          | .830                             | .02                                              | 0.78                                                                    | .92                                                               |
| 23    | 74.7                            | 1.5                 | 73.9                | 2.3                          | .824                             | 8.97                                             | .69                                                                     | .93                                                               |
| 24    | 75.4                            | 1.8                 | 74.5                | 2.7                          | .840                             | 9.12                                             | .83                                                                     | .92                                                               |
| 25    | 73.8                            | 3.5                 | 72.0                | 5.3                          | .776                             | 8.42                                             | 1.56                                                                    | .84                                                               |
| 26    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 27    | 74.5                            | 5.7                 | 71.6                | 8.6                          | .766                             | .25                                              | 2.63                                                                    | .76                                                               |
| 28    | 73.6                            | 5.8                 | 70.7                | 8.7                          | .744                             | .03                                              | .59                                                                     | .76                                                               |
| 29    | 70.2                            | 7.6                 | 66.4                | 11.4                         | .646                             | 7.01                                             | 3.12                                                                    | .69                                                               |
| 30    | 71.8                            | 5.8                 | 68.9                | 8.7                          | .701                             | .60                                              | 2.47                                                                    | .76                                                               |
| 31    | 74.3                            | 5.3                 | 71.6                | 8.0                          | .766                             | 8.27                                             | .42                                                                     | .77                                                               |

All the Hygrometrical elements are computed by the Greenwich Constants.

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taken at the Surveyor General's Office, Calcutta,  
in the month of October, 1862.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fabt. | Range of the Barometer for<br>each hour during the<br>month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture for each hour<br>during the<br>month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|---------------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                                | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                                   | o    | o     |
| Mid-<br>night. | 29.763                                          | 29.969                                                       | 29.532  | 0.437   | 78.7                          | 83.6                                                                | 70.9 | 12.7  |
| 1              | .759                                            | .955                                                         | .519    | .436    | 78.5                          | 83.4                                                                | 71.0 | 12.4  |
| 2              | .753                                            | .950                                                         | .493    | .457    | 78.4                          | 83.2                                                                | 72.6 | 10.6  |
| 3              | .740                                            | .915                                                         | .481    | .461    | 78.5                          | 83.2                                                                | 73.2 | 10.0  |
| 4              | .746                                            | .910                                                         | .486    | .454    | 77.8                          | 81.6                                                                | 72.0 | 9.6   |
| 5              | .753                                            | .957                                                         | .496    | .461    | 78.0                          | 82.4                                                                | 71.7 | 10.7  |
| 6              | .772                                            | .983                                                         | .514    | .469    | 77.9                          | 82.2                                                                | 72.0 | 10.2  |
| 7              | .792                                            | 30.003                                                       | .531    | .472    | 78.4                          | 83.0                                                                | 73.2 | 9.8   |
| 8              | .820                                            | .024                                                         | .540    | .484    | 80.3                          | 84.6                                                                | 75.0 | 9.6   |
| 9              | .828                                            | .037                                                         | .584    | .453    | 81.7                          | 86.4                                                                | 75.6 | 10.8  |
| 10             | .825                                            | .025                                                         | .589    | .436    | 82.8                          | 87.2                                                                | 75.0 | 12.2  |
| 11             | .806                                            | .009                                                         | .580    | .429    | 84.1                          | 88.6                                                                | 76.2 | 12.4  |
|                |                                                 |                                                              |         |         |                               |                                                                     |      |       |
| Noon.          | .780                                            | 29.983                                                       | .561    | .422    | 84.8                          | 89.4                                                                | 76.6 | 12.8  |
| 1              | .753                                            | .964                                                         | .552    | .412    | 85.2                          | 90.8                                                                | 76.2 | 14.6  |
| 2              | .728                                            | .940                                                         | .544    | .396    | 84.5                          | 90.0                                                                | 76.8 | 13.2  |
| 3              | .716                                            | .929                                                         | .546    | .383    | 84.1                          | 90.9                                                                | 76.2 | 14.7  |
| 4              | .723                                            | .931                                                         | .535    | .396    | 84.0                          | 90.8                                                                | 75.4 | 15.4  |
| 5              | .730                                            | .940                                                         | .574    | .366    | 83.0                          | 89.4                                                                | 75.2 | 14.2  |
| 6              | .731                                            | .947                                                         | .543    | .404    | 81.5                          | 87.8                                                                | 75.3 | 12.5  |
| 7              | .754                                            | .966                                                         | .562    | .404    | 80.6                          | 86.0                                                                | 75.5 | 10.5  |
| 8              | .771                                            | .987                                                         | .571    | .416    | 80.2                          | 86.2                                                                | 75.5 | 10.7  |
| 9              | .784                                            | .991                                                         | .571    | .420    | 79.9                          | 85.4                                                                | 75.4 | 10.0  |
| 10             | .790                                            | .987                                                         | .577    | .410    | 79.5                          | 85.0                                                                | 74.8 | 10.2  |
| 11             | .790                                            | .988                                                         | .564    | .424    | 78.9                          | 84.8                                                                | 74.6 | 10.2  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the Observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of October, 1862.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force<br>of Vapour. | Mean Weight of Va-<br>pour in a Cubic<br>foot of air. | Additional Weight of<br>Vapour required<br>for complete satu-<br>ration. | Mean degree of Hu-<br>midity, complete<br>saturation being<br>unity. |
|----------------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------|
|                | o                               | o                   | o                   | o                            | Inches.                          | Troy gra.                                             | Troy gra.                                                                |                                                                      |
| Mid-<br>night. | 76.7                            | 2.0                 | 75.7                | 3.0                          | 0.873                            | 9.45                                                  | 0.96                                                                     | 0.91                                                                 |
| 1              | 76.5                            | 2.0                 | 75.5                | 3.0                          | .868                             | .40                                                   | .95                                                                      | .91                                                                  |
| 2              | 76.5                            | 1.9                 | 75.5                | 2.9                          | .868                             | .40                                                   | .91                                                                      | .91                                                                  |
| 3              | 76.7                            | 1.8                 | 75.8                | 2.7                          | .876                             | .48                                                   | .87                                                                      | .92                                                                  |
| 4              | 76.0                            | 1.8                 | 75.1                | 2.7                          | .857                             | .28                                                   | .85                                                                      | .92                                                                  |
| 5              | 76.2                            | 1.8                 | 75.3                | 2.7                          | .862                             | .34                                                   | .85                                                                      | .92                                                                  |
| 6              | 76.1                            | 1.8                 | 75.2                | 2.7                          | .860                             | .31                                                   | .85                                                                      | .92                                                                  |
| 7              | 76.5                            | 1.9                 | 75.5                | 2.9                          | .868                             | .40                                                   | .91                                                                      | .91                                                                  |
| 8              | 76.9                            | 3.4                 | 75.2                | 5.1                          | .860                             | .28                                                   | 1.63                                                                     | .85                                                                  |
| 9              | 77.6                            | 4.1                 | 75.5                | 6.2                          | .868                             | .35                                                   | 2.02                                                                     | .82                                                                  |
| 10             | 77.7                            | 5.1                 | 75.1                | 7.7                          | .857                             | .19                                                   | .56                                                                      | .78                                                                  |
| 11             | 78.2                            | 5.9                 | 75.2                | 8.9                          | .860                             | .20                                                   | 3.01                                                                     | .75                                                                  |
| Noon.          | 78.1                            | 6.7                 | 74.7                | 10.1                         | .846                             | .05                                                   | .41                                                                      | .73                                                                  |
| 1              | 78.4                            | 6.8                 | 75.0                | 10.2                         | .854                             | .12                                                   | .49                                                                      | .72                                                                  |
| 2              | 77.9                            | 6.6                 | 74.6                | 9.9                          | .843                             | .02                                                   | .33                                                                      | .73                                                                  |
| 3              | 77.7                            | 6.4                 | 74.5                | 9.6                          | .840                             | .00                                                   | .21                                                                      | .74                                                                  |
| 4              | 77.6                            | 6.4                 | 74.4                | 9.6                          | .838                             | 8.97                                                  | .20                                                                      | .74                                                                  |
| 5              | 77.9                            | 5.1                 | 75.3                | 7.7                          | .862                             | 9.25                                                  | 2.57                                                                     | .78                                                                  |
| 6              | 77.7                            | 3.8                 | 75.8                | 5.7                          | .876                             | .43                                                   | 1.88                                                                     | .83                                                                  |
| 7              | 77.6                            | 3.0                 | 76.1                | 4.5                          | .885                             | .53                                                   | .48                                                                      | .87                                                                  |
| 8              | 77.5                            | 2.7                 | 76.1                | 4.1                          | .885                             | .55                                                   | .33                                                                      | .88                                                                  |
| 9              | 77.4                            | 2.5                 | 76.1                | 3.8                          | .885                             | .55                                                   | .23                                                                      | .89                                                                  |
| 10             | 77.1                            | 2.4                 | 75.9                | 3.6                          | .879                             | .49                                                   | .17                                                                      | .89                                                                  |
| 11             | 76.7                            | 2.2                 | 75.6                | 3.3                          | .871                             | .42                                                   | .05                                                                      | .90                                                                  |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of October, 1862.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                |
|-------|-----------------------|---------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------|
|       | °                     | Inches                          |                                   |                                                                                                                           |
| 1     | 132.4                 | ...                             | W. & S. & N. E.                   | Cloudless till 7 A. M. Scatd. ☽ till 6 P. M. cloudless afterwards.                                                        |
| 2     | 134.0                 | ...                             | W. & S. & S. W.                   | Scatd. clouds.                                                                                                            |
| 3     | 131.2                 | 0.08                            | S. W. & W.                        | Cloudless till 4 A. M. Scatd. ☽ & ☾ till 1 P. M. cloudy afterwards; also raining between 1 & 2 P. M.                      |
| 4     | ...                   | 3.83                            | N. W. & W.                        | Cloudy; also constantly raining between 7 A. M. & 11 P. M.                                                                |
| 5     | ...                   | 0.15                            | <i>Sunday.</i>                    |                                                                                                                           |
| 6     | ...                   | 1.03                            | N. W. & S. E. & S.                | Scatd. ☽ till 3 A. M.; cloudy till 2 P. M.; Scatd. ☽ afterwards; also raining between 8 & 9 A. M. and between 1 & 2 P. M. |
| 7     | ...                   | 0.10                            | S. E. & S.                        | Cloudy; also drizzling at Midnight, 1 A. M. & between 11 A. M. and Noon.                                                  |
| 8     | ...                   | 0.22                            | S.                                | Scatd. clouds; also drizzling between 11 and Noon, between 1 & 2, between 4 & 5 and between 7 & 8 P. M.                   |
| 9     | 131.0                 | 0.10                            | S.                                | Cloudless till 6 A. M. Scatd. clouds afterwards; also slightly raining between 6 & 7 P. M.                                |
| 10    | ...                   | ...                             | S. & E.                           | Scatd. ☽ & ☽ till 3 A. M.; cloudy till 6 P. M. cloudless afterwards.                                                      |
| 11    | 136.4                 | ...                             | S. E. & S.                        | Scatd. ☽ till 3 A. M. cloudy afterwards; also slightly drizzling at 1 P. M. & between 2 & 3 P. M.                         |
| 12    | ...                   | 1.12                            | <i>Sunday.</i>                    |                                                                                                                           |
| 13    | 136.0                 | ...                             | S. E. & S.                        | Scatd. ☽ till 4 A. M.; Scatd. ☽ till 5 P. M. cloudless afterwards; also foggy between 5 & 7 A. M.                         |
| 14    | 148.0                 | ...                             | S.                                | Scatd. ☽ & ☽ till Noon; cloudy afterwards; also slightly drizzling at 2, 4 and 5 P. M.                                    |
| 15    | ...                   | ...                             | S.                                | Cloudy till 6 P. M. cloudless afterwards; also slightly drizzling at 4 A. M. & between 2 & 3 P. M.                        |
| 16    | 137.0                 | ...                             | S.                                | Cloudy till 6 A. M. Scatd. ☽ & ☽ till 3 P. M. cloudy afterwards; also very slightly drizzled at 6 P. M.                   |
| 17    | 144.0                 | ...                             | S. W. & W.                        | Cloudless till 8 A. M. Scatd. ☽ & ☽ till 6 P. M. cloudless afterwards.                                                    |
| 18    | 142.8                 | ...                             | S. E. & S. & O. W.                | Cloudless till 8 A. M. Scatd. ☽ till 5 P. M. cloudless afterwards.                                                        |
| 19    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                           |

☽ Cirri, ☽ Cirro strati, ☽ Cumuli, ☽ Cumulo strati, ☽ Nimbi, —i Strati, ☽ Cirro cumuli.



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taken at the Surveyor General's Office, Calcutta,  
in the month of October, 1862.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                          |
|-------|-----------------------|---------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------|
|       |                       | Inch                            |                                   |                                                                                                     |
| 20    | 140.7                 | ...                             | E. & S. E.                        | Cloudless till 7 A. M. Scatd. \i & \i till 4 P. M. cloudless afterwards.                            |
| 21    | ...                   | 0.52                            | S. & E.                           | Cloudless till 6 A. M. Scatd. \i till 11 A. M. cloudy afterwards; also raining at 1 & 2 P. M.       |
| 22    | ...                   | 1.02                            | E. & S. E.                        | Cloudy; also incessantly raining from 10 A. M. to 11 P. M.                                          |
| 23    | ...                   | 3.76                            | E. & S.                           | Cloudy; also raining the whole day.                                                                 |
| 24    | ...                   | 2.47                            | E. & S.                           | Cloudy; also raining at Midnight, 1, 6 and 7 A. M.                                                  |
| 25    | 138.5                 | ...                             | N. W. & N.                        | Cloudy till 9 A. M. Scatd. \i & \i till 6 P. M. cloudless afterwards; also drizzling at 2 & 4 A. M. |
| 26    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                     |
| 27    | 144.4                 | ...                             | S. W. & S. & W.                   | Cloudless.                                                                                          |
| 28    | 146.5                 | ...                             | S. & N.                           | Cloudless till 11 A. M. Scatd. \i till 5 P. M. cloudless afterwards; also foggy at 5 & 6 A. M.      |
| 29    | 147.0                 | ...                             | N.                                | Cloudless.                                                                                          |
| 30    | 136.2                 | ...                             | N. W. & N.                        | Cloudless till 7 A. M. Scatd. \i till 2 P. M. Scatd. \i till 8 P. M. cloudless afterwards.          |
| 31    | 141.8                 | ...                             | N. & W.                           | Cloudless till 6 A. M. Scatd. \i & \i till 3 P. M. cloudless afterwards.                            |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of October, 1862.*

MONTHLY RESULTS.

|                                                               |    |    | Inches |
|---------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month,                   | .. | .. | 29.767 |
| Max. height of the Barometer occurred at 9 A. M. on the 31st, | .. | .. | 30.037 |
| Min. height of the Barometer occurred at 3 A. M. on the 24th, | .. | .. | 29.481 |
| Extreme range of the Barometer during the month,              | .. | .. | 0.556  |
| Mean of the daily Max. Pressures,                             | .. | .. | 29.837 |
| Ditto ditto Min. ditto,                                       | .. | .. | 29.704 |
| Mean daily range of the Barometer during the month,           | .. | .. | 0.133  |

|                                                       |    |    | °    |
|-------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,              | .. | .. | 80.9 |
| Max. Temperature occurred at 3 P. M. on the 1st,      | .. | .. | 90.9 |
| Min. Temperature occurred at Midnight on the 30th,    | .. | .. | 70.9 |
| Extreme range of the Temperature during the month,    | .. | .. | 20.0 |
| Mean of the daily Max. Temperature,                   | .. | .. | 86.1 |
| Ditto ditto Min. ditto,                               | .. | .. | 77.2 |
| Mean daily range of the Temperature during the month, | .. | .. | 8.9  |

|                                                            |    |    | °    |
|------------------------------------------------------------|----|----|------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 77.2 |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 3.7  |
| Computed Mean Dew-point for the month,                     | .. | .. | 75.3 |
| Mean Dry Bulb Thermometer above computed Mean Dew-point,   | .. | .. | 5.6  |

|                                             |    |    | Inches |
|---------------------------------------------|----|----|--------|
| Mean Elastic force of Vapour for the month, | .. | .. | 0.862  |

|                                                                         |    |    | Troy grains |
|-------------------------------------------------------------------------|----|----|-------------|
| Mean Weight of Vapour for the month,                                    | .. | .. | 9.29        |
| Additional Weight of Vapour required for complete saturation,           | .. | .. | 1.81        |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.84        |

|                                                    |    |    | Inches |
|----------------------------------------------------|----|----|--------|
| Rained 17 days, Max. fall of rain during 24 hours, | .. | .. | 3.83   |
| Total amount of rain during the month,             | .. | .. | 14.40  |
| Prevailing direction of the Wind,                  | .. | .. | S.     |

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in the month of October, 1862.*

### MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

| Date.     | N. | Rain on. | Rai | E.           | Rain on. | S. E. | Rain on. | S. | Rain on. | S. W. | Rain on. | W. | Rain on. | N. W. | Rain on. | Calm. | Rain on. |
|-----------|----|----------|-----|--------------|----------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|-------|----------|
|           |    |          |     | No. of days. |          |       |          |    |          |       |          |    |          |       |          |       |          |
| Midnight. | 2  |          |     | 3            | 2        | 4     |          | 7  | 1        | 2     |          | 3  |          | 2     |          | 1     |          |
| 1         | 2  |          |     | 3            | 2        | 4     |          | 8  | 1        | 3     |          | 3  |          | 2     |          | 1     |          |
| 2         | 2  | 1        |     | 2            | 1        | 5     |          | 9  |          | 3     |          | 3  |          | 2     |          | 1     |          |
| 3         | 1  |          |     | 2            | 1        | 5     |          | 7  |          | 3     |          | 3  |          | 1     |          |       |          |
| 4         | 2  | 1        |     | 2            | 1        | 6     |          | 7  |          | 3     |          | 3  | 1        | 2     |          |       |          |
| 5         | 2  |          |     | 2            | 1        | 5     |          | 9  |          | 2     |          | 4  |          | 2     |          |       |          |
| 6         | 2  |          |     | 2            | 1        | 5     |          | 9  | 1        | 3     |          | 4  |          | 2     |          |       |          |
| 7         | 3  | 1        |     | 3            | 1        | 4     |          | 9  | 1        | 3     |          | 2  |          | 3     |          |       |          |
| 8         | 1  |          |     | 3            | 1        |       |          | 8  |          | 3     |          | 4  |          | 3     | 1        |       |          |
| 9         | 3  |          |     | 4            | 1        | 1     |          | 8  | 1        | 2     |          | 5  |          | 2     | 1        |       |          |
| 10        | 4  |          |     | 4            | 2        | 1     |          | 7  |          | 3     |          | 5  |          | 2     | 1        |       |          |
| 11        | 4  |          |     | 5            | 1        | 2     | 1        | 6  |          | 3     |          | 4  |          | 3     |          |       |          |
| Noon.     | 3  | 1        |     | 3            | 1        | 3     | 2        | 5  |          | 3     |          | 6  | 1        | 3     | 1        |       |          |
| 1         | 3  | 1        |     | 2            | 1        | 2     | 1        | 6  | 1        | 2     |          | 7  |          | 3     | 1        | 1     |          |
| 2         | 3  | 1        |     | 2            | 1        | 4     | 1        | 3  | 2        | 5     |          | 4  | 1        | 5     |          |       |          |
| 3         | 4  |          |     | 2            | 1        | 3     | 1        | 4  |          | 5     | 1        | 4  | 1        | 5     | 1        |       |          |
| 4         | 4  | 1        |     | 2            |          | 5     | 2        | 4  |          | 4     |          | 1  |          | 3     |          | 1     |          |
| 5         | 2  | 1        |     | 3            | 1        | 6     | 1        | 5  |          | 3     |          | 2  |          | 4     | 1        |       |          |
| 6         | 1  | 1        |     | 3            | 1        | 5     |          | 8  |          | 2     |          | 2  |          | 5     | 1        |       |          |
| 7         | 1  | 1        |     | 5            | 1        | 4     |          | 8  | 3        | 1     |          | 2  |          | 5     | 1        |       |          |
| 8         | 1  | 1        |     | 6            | 2        | 2     |          | 10 |          | 1     |          | 3  |          | 3     | 1        |       |          |
| 9         | 2  | 1        |     | 6            | 1        | 2     |          | 10 | 1        | 1     |          | 4  |          | 2     |          |       |          |
| 10        | 2  |          |     | 5            | 1        | 2     |          | 11 | 1        |       |          | 4  |          | 3     |          |       |          |
| 11        | 2  | 1        |     | 5            | 1        | 2     |          | 11 | 1        |       |          | 3  |          | 3     |          |       |          |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of November, 1862.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.  
Height of the Cistern of the Standard Barometer above the Sea-level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 29.979                                          | 30.042                                    | 29.984  | 0.108   | 79.3                          | 85.0                                          | 75.4 | 9.6   |
| 2     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 3     | .910                                            | 29.993                                    | .848    | .145    | 77.7                          | 84.2                                          | 72.0 | 12.2  |
| 4     | .915                                            | .988                                      | .859    | .129    | 76.4                          | 83.4                                          | 71.6 | 11.8  |
| 5     | .946                                            | 30.028                                    | .902    | .126    | 74.3                          | 82.6                                          | 67.8 | 14.8  |
| 6     | .908                                            | 29.975                                    | .848    | .127    | 73.0                          | 80.2                                          | 66.3 | 13.9  |
| 7     | .869                                            | .919                                      | .816    | .103    | 73.8                          | 81.0                                          | 68.4 | 12.6  |
| 8     | .877                                            | .948                                      | .834    | .109    | 74.6                          | 82.0                                          | 68.4 | 13.6  |
| 9     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 10    | .874                                            | .933                                      | .835    | .098    | 75.9                          | 83.2                                          | 70.0 | 13.2  |
| 11    | .907                                            | .965                                      | .871    | .094    | 75.3                          | 82.3                                          | 69.0 | 13.3  |
| 12    | .956                                            | 30.039                                    | .906    | .133    | 71.9                          | 81.6                                          | 69.4 | 12.2  |
| 13    | .932                                            | .001                                      | .889    | .112    | 72.8                          | 80.6                                          | 65.6 | 15.0  |
| 14    | .898                                            | 29.973                                    | .847    | .126    | 72.9                          | 81.7                                          | 66.0 | 15.7  |
| 15    | .924                                            | 30.009                                    | .875    | .134    | 73.5                          | 81.8                                          | 66.0 | 15.8  |
| 16    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 17    | .933                                            | .015                                      | .880    | .135    | 72.0                          | 80.0                                          | 64.6 | 15.4  |
| 18    | .914                                            | 29.970                                    | .860    | .110    | 71.9                          | 80.2                                          | 64.8 | 15.4  |
| 19    | .995                                            | 30.066                                    | .939    | .127    | 72.9                          | 81.0                                          | 65.6 | 15.4  |
| 20    | 30.011                                          | .104                                      | .937    | .167    | 73.1                          | 81.0                                          | 66.0 | 15.0  |
| 21    | 29.931                                          | .006                                      | .863    | .143    | 72.3                          | 80.0                                          | 66.5 | 13.5  |
| 22    | .892                                            | 29.951                                    | .832    | .119    | 71.5                          | 80.0                                          | 64.2 | 15.8  |
| 23    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 24    | .895                                            | .960                                      | .845    | .115    | 73.5                          | 81.6                                          | 66.2 | 15.4  |
| 25    | .937                                            | .997                                      | .885    | .112    | 74.8                          | 83.2                                          | 68.4 | 14.8  |
| 26    | .955                                            | 30.029                                    | .902    | .127    | 73.8                          | 81.6                                          | 67.2 | 14.4  |
| 27    | .914                                            | 29.980                                    | .851    | .129    | 73.6                          | 81.8                                          | 66.8 | 15.0  |
| 28    | .917                                            | .971                                      | .868    | .103    | 75.1                          | 82.8                                          | 69.8 | 13.0  |
| 29    | .937                                            | 30.019                                    | .889    | .130    | 72.4                          | 79.9                                          | 66.2 | 13.7  |
| 30    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly Observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of November, 1862.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a Cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humi-<br>dity, complete satura-<br>tion being unitv. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------|
| 1     | 73.7                            | 5.6                 | 70.9                | 8.4                          | Inches.<br>0.748                 | T. gr.<br>8.10                                   | T. gr.<br>2.49                                                          | 0.77                                                                |
| 2     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 3     | 71.8                            | 5.9                 | 68.8                | 8.9                          | .699                             | 7.57                                             | .53                                                                     | .75                                                                 |
| 4     | 69.1                            | 7.3                 | 65.4                | 11.0                         | .626                             | 6.80                                             | .92                                                                     | .70                                                                 |
| 5     | 66.4                            | 7.9                 | 62.4                | 11.9                         | .567                             | .18                                              | .94                                                                     | .68                                                                 |
| 6     | 66.8                            | 6.2                 | 63.7                | 9.3                          | .591                             | .47                                              | .29                                                                     | .74                                                                 |
| 7     | 68.0                            | 5.8                 | 65.1                | 8.7                          | .619                             | .77                                              | .21                                                                     | .75                                                                 |
| 8     | 68.8                            | 5.8                 | 65.9                | 8.7                          | .636                             | .93                                              | .27                                                                     | .75                                                                 |
| 9     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 10    | 69.9                            | 6.0                 | 66.9                | 9.0                          | .657                             | 7.15                                             | .42                                                                     | .75                                                                 |
| 11    | 68.6                            | 6.7                 | 65.2                | 10.1                         | .621                             | 6.77                                             | .63                                                                     | .72                                                                 |
| 12    | 67.9                            | 7.0                 | 64.4                | 10.5                         | .605                             | .59                                              | .69                                                                     | .71                                                                 |
| 13    | 66.2                            | 6.6                 | 62.9                | 9.9                          | .576                             | .30                                              | .41                                                                     | .72                                                                 |
| 14    | 66.7                            | 6.2                 | 63.6                | 9.3                          | .590                             | .45                                              | .28                                                                     | .74                                                                 |
| 15    | 66.7                            | 6.8                 | 63.3                | 10.2                         | .584                             | .38                                              | .52                                                                     | .72                                                                 |
| 16    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 17    | 65.3                            | 6.7                 | 61.9                | 10.1                         | .557                             | .11                                              | .39                                                                     | .72                                                                 |
| 18    | 65.9                            | 6.0                 | 62.9                | 9.0                          | .576                             | .31                                              | .17                                                                     | .74                                                                 |
| 19    | 67.1                            | 5.8                 | 64.2                | 8.7                          | .601                             | .57                                              | .16                                                                     | .75                                                                 |
| 20    | 67.3                            | 5.8                 | 64.4                | 8.7                          | .605                             | .62                                              | .17                                                                     | .75                                                                 |
| 21    | 65.5                            | 6.8                 | 62.1                | 10.2                         | .561                             | .14                                              | .44                                                                     | .72                                                                 |
| 22    | 64.3                            | 7.2                 | 60.7                | 10.8                         | .536                             | 5.87                                             | .51                                                                     | .70                                                                 |
| 23    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 24    | 68.0                            | 5.5                 | 65.2                | 8.3                          | .621                             | 6.80                                             | .10                                                                     | .76                                                                 |
| 25    | 68.6                            | 6.2                 | 65.5                | 9.3                          | .628                             | .85                                              | .41                                                                     | .74                                                                 |
| 26    | 67.6                            | 6.2                 | 64.5                | 9.3                          | .607                             | .64                                              | .34                                                                     | .74                                                                 |
| 27    | 67.7                            | 5.9                 | 64.7                | 8.9                          | .611                             | .68                                              | .25                                                                     | .75                                                                 |
| 28    | 68.6                            | 6.5                 | 65.3                | 9.8                          | .623                             | .79                                              | .55                                                                     | .73                                                                 |
| 29    | 65.7                            | 6.7                 | 62.3                | 10.1                         | .565                             | .18                                              | .42                                                                     | .72                                                                 |
| 30    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of November, 1862.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>for each hour during<br>the month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Temperature<br>for each hour during<br>the month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|----------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                           | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                              | o    | .o    |
| Mid-<br>night. | 29.922                                          | 30.041                                                       | 29.858  | 0.183   | 70.5                          | 76.8                                                           | 67.2 | 9.6   |
| 1              | .915                                            | .036                                                         | .855    | .181    | 70.1                          | 76.4                                                           | 67.0 | 9.4   |
| 2              | .907                                            | .024                                                         | .848    | .176    | 69.6                          | 76.4                                                           | 66.4 | 10.0  |
| 3              | .904                                            | .018                                                         | .844    | .174    | 69.2                          | 75.8                                                           | 65.8 | 10.0  |
| 4              | .898                                            | .014                                                         | .845    | .169    | 68.6                          | 75.6                                                           | 65.2 | 10.4  |
| 5              | .914                                            | .031                                                         | .855    | .176    | 68.5                          | 75.4                                                           | 65.0 | 10.4  |
| 6              | .931                                            | .048                                                         | .879    | .169    | 67.9                          | 75.6                                                           | 64.2 | 11.4  |
| 7              | .952                                            | .072                                                         | .888    | .184    | 68.3                          | 76.0                                                           | 64.8 | 11.2  |
| 8              | .975                                            | .088                                                         | .907    | .181    | 71.9                          | 77.8                                                           | 67.4 | 10.4  |
| 9              | .992                                            | .104                                                         | .915    | .189    | 74.3                          | 78.5                                                           | 71.0 | 7.5   |
| 10             | .991                                            | .091                                                         | .919    | .172    | 76.5                          | 79.8                                                           | 73.8 | 6.0   |
| 11             | .971                                            | .075                                                         | .910    | .165    | 78.4                          | 82.6                                                           | 75.8 | 6.8   |
| Noon.          | .944                                            | .038                                                         | .890    | .148    | 80.0                          | 84.2                                                           | 78.0 | 6.2   |
| 1              | .912                                            | 29.998                                                       | .858    | .140    | 81.0                          | 84.6                                                           | 78.9 | 5.7   |
| 2              | .890                                            | .969                                                         | .838    | .181    | 81.6                          | 85.0                                                           | 79.9 | 5.1   |
| 3              | .882                                            | .959                                                         | .830    | .129    | 81.5                          | 84.6                                                           | 79.4 | 5.2   |
| 4              | .879                                            | .953                                                         | .816    | .137    | 80.1                          | 83.5                                                           | 77.4 | 6.1   |
| 5              | .883                                            | .961                                                         | .824    | .137    | 78.4                          | 82.0                                                           | 75.2 | 6.8   |
| 6              | .893                                            | .981                                                         | .832    | .149    | 76.0                          | 81.0                                                           | 72.4 | 8.6   |
| 7              | .912                                            | 30.013                                                       | .852    | .161    | 74.4                          | 79.6                                                           | 71.0 | 8.6   |
| 8              | .926                                            | .041                                                         | .868    | .173    | 73.7                          | 79.0                                                           | 71.2 | 7.8   |
| 9              | .935                                            | .050                                                         | .875    | .175    | 72.3                          | 78.0                                                           | 69.2 | 8.8   |
| 10             | .936                                            | .066                                                         | .878    | .188    | 71.7                          | 77.6                                                           | 68.4 | 9.2   |
| 11             | .931                                            | .059                                                         | .874    | .185    | 71.0                          | 77.4                                                           | 67.4 | 10.0  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the Observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of November, 1862.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb<br>Thermometer. | Dry Bulb Above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Va-<br>pour in a Cubic foot<br>of air. | Additional Weight of<br>Vapour required for<br>complete saturation. | Mean degree of Hu-<br>midity, complete satu-<br>ration being unity. |
|----------------|-------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
|                | °                             | °                   | °                   | °                            | Inches.                          | Troy grs.                                             | Troy grs.                                                           |                                                                     |
| Mid-<br>night. | 67.4                          | 3.1                 | 65.8                | 4.7                          | .634                             | 6.97                                                  | 1.16                                                                | 0.86                                                                |
| 1              | 66.9                          | 3.2                 | 65.3                | 4.8                          | .623                             | .86                                                   | .17                                                                 | .85                                                                 |
| 2              | 66.6                          | 3.0                 | 65.1                | 4.5                          | .619                             | .82                                                   | .08                                                                 | .86                                                                 |
| 3              | 66.3                          | 2.9                 | 64.8                | 4.4                          | .613                             | .78                                                   | .03                                                                 | .87                                                                 |
| 4              | 65.7                          | 2.9                 | 64.2                | 4.4                          | .601                             | .64                                                   | .03                                                                 | .87                                                                 |
| 5              | 65.8                          | 2.7                 | 64.4                | 4.1                          | .605                             | .69                                                   | 0.96                                                                | .88                                                                 |
| 6              | 65.2                          | 2.7                 | 63.6                | 4.3                          | .590                             | .52                                                   | .99                                                                 | .87                                                                 |
| 7              | 65.5                          | 2.8                 | 63.8                | 4.5                          | .593                             | .54                                                   | 1.06                                                                | .86                                                                 |
| 8              | 66.9                          | 5.0                 | 64.4                | 7.5                          | .605                             | .63                                                   | .85                                                                 | .78                                                                 |
| 9              | 67.7                          | 6.6                 | 64.4                | 9.9                          | .605                             | .61                                                   | 2.51                                                                | .73                                                                 |
| 10             | 68.2                          | 8.3                 | 64.0                | 12.5                         | .597                             | .48                                                   | 3.27                                                                | .67                                                                 |
| 11             | 68.2                          | 10.2                | 63.1                | 15.3                         | .580                             | .28                                                   | 4.03                                                                | .61                                                                 |
| Noon.          | 68.5                          | 11.5                | 62.7                | 17.3                         | .572                             | .17                                                   | .64                                                                 | .57                                                                 |
| 1              | 68.5                          | 12.5                | 62.2                | 18.8                         | .563                             | .05                                                   | 5.09                                                                | .54                                                                 |
| 2              | 68.8                          | 12.8                | 62.4                | 19.2                         | .567                             | .09                                                   | .25                                                                 | .54                                                                 |
| 3              | 68.8                          | 12.7                | 62.4                | 19.1                         | .567                             | .09                                                   | .22                                                                 | .54                                                                 |
| 4              | 68.5                          | 11.6                | 62.7                | 17.4                         | .572                             | .17                                                   | 4.67                                                                | .57                                                                 |
| 5              | 69.0                          | 9.4                 | 64.3                | 14.1                         | .603                             | .53                                                   | 3.78                                                                | .63                                                                 |
| 6              | 69.6                          | 6.4                 | 66.4                | 9.6                          | .646                             | 7.03                                                  | 2.57                                                                | .73                                                                 |
| 7              | 69.2                          | 5.2                 | 66.6                | 7.8                          | .651                             | .09                                                   | .06                                                                 | .78                                                                 |
| 8              | 69.1                          | 4.6                 | 66.8                | 6.9                          | .655                             | .16                                                   | 1.80                                                                | .80                                                                 |
| 9              | 68.2                          | 4.1                 | 66.1                | 6.2                          | .640                             | .01                                                   | .57                                                                 | .82                                                                 |
| 10             | 67.9                          | 3.8                 | 66.0                | 5.7                          | .638                             | .00                                                   | .43                                                                 | .83                                                                 |
| 11             | 67.6                          | 3.4                 | 65.9                | 5.1                          | .636                             | 6.99                                                  | .26                                                                 | .85                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of November, 1862.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                           |
|-------|-----------------------|---------------------------------|-----------------------------------|----------------------------------------------------------------------|
|       | °                     | Inches.                         |                                   |                                                                      |
| 1     | 143.5                 | ...                             | N.                                | Cloudless till 3 A. M. Scatd. ~i till 9 P. M. cloudless afterwards.  |
| 2     | ...                   | ...                             | <i>Sunday.</i>                    |                                                                      |
| 3     | 138.0                 | ...                             | N. W. & N.                        | Cloudless; also slightly foggy at 10 & 11 P. M.                      |
| 4     | 141.6                 | ...                             | N. & N. W.                        | Cloudless.                                                           |
| 5     | 138.0                 | ...                             | N. & W.                           | Cloudless; also slightly foggy between 9 & 11 P. M.                  |
| 6     | 138.0                 | ...                             | N. W. & N. & S. W.                | Cloudless; also foggy between Mid-night & 2 A. M.                    |
| 7     | 144.2                 | ...                             | W. & N.                           | Cloudless till 11 A. M. Scatd. ~i till 3 P. M. cloudless afterwards. |
| 8     | 139.9                 | ...                             | S. & N. & S. W.                   | Cloudless till 9 A. M. Scatd. ~i till 2 P. M. cloudless afterwards.  |
| 9     | ...                   | ...                             | <i>Sunday.</i>                    |                                                                      |
| 10    | 140.0                 | ...                             | N. W.                             | Scatd. ~i till 3 P. M. cloudless afterwards.                         |
| 11    | 141.2                 | ...                             | N. & N. W.                        | Cloudless.                                                           |
| 12    | 140.8                 | ...                             | N.                                | Cloudless.                                                           |
| 13    | 138.5                 | ...                             | N.                                | Cloudless.                                                           |
| 14    | 139.5                 | ...                             | N.                                | Cloudless; also slightly foggy between 7 & 11 P. M.                  |
| 15    | 140.0                 | ...                             | N.                                | Cloudless.                                                           |
| 16    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                      |
| 17    | 140.0                 | ...                             | N. W. & N.                        | Cloudless; also foggy at 10 & 11 P. M.                               |
| 18    | 137.0                 | ...                             | N. & N. W.                        | Cloudless; also slightly foggy between Midnight & 5 A. M.            |
| 19    | 140.0                 | ...                             | N. W. & N.                        | Cloudless.                                                           |
| 20    | 142.5                 | ...                             | N. & N. W.                        | Cloudless.                                                           |
| 21    | 137.0                 | ...                             | W. & N.                           | Cloudless.                                                           |
| 22    | 139.0                 | ...                             | N. & S. W.                        | Cloudless.                                                           |
| 23    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                      |
| 24    | 141.5                 | ...                             | N. & W.                           | Cloudless till 9 A. M. Scatd. ~i till 4 P. M. cloudless afterwards.  |
| 25    | 142.8                 | ...                             | W. & N. W.                        | Cloudless.                                                           |
| 26    | 137.5                 | ...                             | W. & N. W.                        | Cloudless; also slightly foggy between 7 & 11 P. M.                  |
| 27    | 139.0                 | ...                             | W. & S. W.                        | Cloudless.                                                           |
| 28    | 140.0                 | ...                             | N. W. & S. W. & W.                | Scatd. ~i till 7 A. M. cloudless afterwards.                         |
| 29    | 139.9                 | ...                             | W. & S. & N. W.                   | Cloudless; also foggy between 9 & 11 P. M.                           |
| 30    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                      |

~i Cirri, ~i Cirro strati, ~i Cumuli, ~i Cumulo strati, ~i Nimbi, —i Strati,  
~i Cirro cumuli.



*Abstract of the Results of the Hourly Meteorological Observations  
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in the month of November, 1862.*

## MONTHLY RESULTS.

|                                                                  | Inches |
|------------------------------------------------------------------|--------|
| Mean height of the Barometer for the month, .. ..                | 29.925 |
| Max. height of the Barometer occurred at 9 A. M. on the 20th, .. | 30.104 |
| Min. height of the Barometer occurred at 4 P. M. on the 7th, ..  | 29.816 |
| <i>Extreme range</i> of the Barometer during the month, ..       | 0.288  |
| Mean of the Daily Max. Pressures, . ..                           | 29.995 |
| Ditto ditto Min. ditto, .. ..                                    | 29.873 |
| <i>Mean daily range</i> of the Barometer during the month, ..    | 0.122  |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| Mean Dry Bulb Thermometer for the month, .. ..                     | 74.1 |
| Max. Temperature occurred at 2 P. M. on the 1st, .. ..             | 85.0 |
| Min. Temperature occurred at 6 A. M. on the 22nd, .. ..            | 64.2 |
| <i>Extreme range</i> of the Temperature during the month, .. ..    | 20.8 |
| Mean of the daily Max. Temperature, .. ..                          | 81.7 |
| Ditto ditto Min. ditto, .. ..                                      | 67.7 |
| <i>Mean daily range</i> of the Temperature during the month, .. .. | 14.0 |
| Mean Wet Bulb Thermometer for the month, .. ..                     | 67.7 |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..      | 6.4  |
| Computed Mean Dew-point for the month, .. ..                       | 64.5 |
| Mean Dry Bulb Thermometer above computed Mean Dew-point, ..        | 9.6  |

|                                                   | Inches |
|---------------------------------------------------|--------|
| Mean Elastic force of Vapour for the month, .. .. | 0.607  |

|                                                                         | Troy grains |
|-------------------------------------------------------------------------|-------------|
| Mean Weight of Vapour for the month, .. ..                              | 6.62        |
| Additional Weight of Vapour required for complete saturation, ..        | 2.45        |
| Mean degree of humidity for the month, complete saturation being unity, | 0.73        |

|                                                           | Inches          |
|-----------------------------------------------------------|-----------------|
| Rained No. days, Max. fall of rain during 24 hours, .. .. | Nil.            |
| Total amount of rain during the month, .. ..              | Nil.            |
| Prevailing direction of the Wind, .. ..                   | S. & N. W. & W. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of November, 1862.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on. | N. E. | Rain on. | E. | Rain on. | S. E. | Rain on. | S. | Rain on. | S. W. | Rain on. | W. | Rain on. | N. W. | Rain on. | Calm. | Rain on. | Missed. |
|-----------|--------------|----------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|-------|----------|---------|
|           | No. of days. |          |       |          |    |          |       |          |    |          |       |          |    |          |       |          |       |          |         |
| Midnight. | 14           |          |       |          |    |          |       |          |    |          | 1     |          | 5  |          | 3     |          |       |          | 2       |
| 1         | 14           |          |       |          |    |          |       |          |    |          | 1     |          | 7  |          | 3     |          |       |          |         |
| 2         | 14           |          |       |          |    |          |       |          |    |          | 1     |          | 8  |          | 2     |          |       |          |         |
| 3         | 12           |          |       |          |    |          |       |          |    |          | 2     |          | 8  |          | 1     |          |       |          | 2       |
| 4         | 12           |          |       |          |    |          |       |          |    |          | 2     |          | 6  |          | 3     |          |       |          | 2       |
| 5         | 9            |          |       |          |    |          |       |          |    |          | 2     |          | 6  |          | 4     |          |       |          | 4       |
| 6         | 11           |          |       |          |    |          | 1     |          |    |          | 2     |          | 6  |          | 4     |          |       |          | 1       |
| 7         | 12           |          |       |          |    |          | 1     |          |    |          | 3     |          | 5  |          | 4     |          |       |          |         |
| 8         | 14           |          |       |          | 1  |          |       |          |    |          |       |          | 5  |          | 4     |          |       |          |         |
| 9         | 14           |          | 1     |          | 1  |          |       |          | 1  |          | 1     |          | 4  |          | 3     |          |       |          |         |
| 10        | 8            |          | 2     |          | 2  |          |       |          | 1  |          | 2     |          | 5  |          | 5     |          |       |          |         |
| 11        | 9            |          | 1     |          | 3  |          |       |          |    |          | 2     |          | 6  |          | 4     |          |       |          |         |
| Noon.     | 11           |          |       |          |    |          |       |          |    |          | 1     |          | 6  |          | 5     |          |       |          |         |
| 1         | 5            |          | 2     |          |    |          | 2     |          | 1  |          | 1     |          | 6  |          | 9     |          |       |          |         |
| 2         | 7            |          | 1     |          |    |          | 2     |          |    |          |       |          | 5  |          | 10    |          |       |          |         |
| 3         | 6            |          | 1     |          |    |          | 1     |          |    |          | 1     |          | 7  |          | 9     |          |       |          |         |
| 4         | 6            |          | 1     |          |    |          |       |          |    | 1        | 2     |          | 2  |          | 13    |          |       |          |         |
| 5         | 9            |          | 1     |          |    |          |       |          | 2  |          | 2     |          | 1  |          | 10    |          |       |          |         |
| 6         | 9            |          |       |          | 1  |          |       |          | 2  |          | 2     |          | 1  |          | 10    |          |       |          |         |
| 7         | 10           |          |       |          |    |          |       |          | 2  |          | 3     |          | 1  |          | 9     |          |       |          |         |
| 8         | 10           |          |       |          |    |          |       |          | 2  |          | 2     |          | 1  |          | 9     |          |       |          | 1       |
| 9         | 10           |          |       |          |    |          |       |          | 2  |          | 3     |          | 1  |          | 8     |          |       |          |         |
| 10        | 10           |          |       |          |    |          |       |          | 3  |          | 3     |          |    |          | 9     |          |       |          |         |
| 11        | 11           |          |       |          |    |          |       |          | 3  |          | 3     |          |    |          | 8     |          |       |          |         |



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of December, 1862.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.

Height of the Cistern of the Standard Barometer above the Sea-level, 18.11.

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 29.963                                          | 30.017                                    | 29.909  | 0.108   | 70.7                          | 79.8                                          | 63.0 | 16.8  |
| 2     | 30.039                                          | .127                                      | .981    | .146    | 69.5                          | 78.6                                          | 62.7 | 15.9  |
| 3     | .039                                            | .110                                      | .987    | .123    | 67.5                          | 77.0                                          | 60.1 | 16.9  |
| 4     | .015                                            | .090                                      | .959    | .131    | 68.6                          | 77.4                                          | 60.2 | 17.2  |
| 5     | 29.979                                          | .047                                      | .910    | .137    | 69.3                          | 78.2                                          | 62.6 | 15.6  |
| 6     | .953                                            | .032                                      | .903    | .129    | 67.9                          | 76.9                                          | 61.4 | 15.5  |
| 7     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 8     | .987                                            | .058                                      | .947    | .111    | 66.3                          | 75.5                                          | 58.9 | 16.6  |
| 9     | .942                                            | .008                                      | .869    | .139    | 63.6                          | 73.0                                          | 55.4 | 17.6  |
| 10    | .924                                            | 29.986                                    | .865    | .121    | 64.5                          | 74.5                                          | 55.4 | 19.1  |
| 11    | .967                                            | 30.038                                    | .916    | .122    | 65.0                          | 75.8                                          | 56.8 | 19.0  |
| 12    | .968                                            | .043                                      | .904    | .139    | 65.6                          | 76.0                                          | 56.5 | 19.5  |
| 13    | .917                                            | 29.993                                    | .861    | .132    | 65.6                          | 75.2                                          | 56.8 | 18.4  |
| 14    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 15    | .913                                            | .986                                      | .852    | .134    | 67.3                          | 77.2                                          | 59.4 | 17.8  |
| 16    | .929                                            | 30.000                                    | .872    | .128    | 67.2                          | 76.6                                          | 60.0 | 16.6  |
| 17    | .936                                            | .005                                      | .876    | .129    | 66.1                          | 75.6                                          | 59.0 | 16.6  |
| 18    | .879                                            | 29.948                                    | .808    | .140    | 65.4                          | 75.9                                          | 58.0 | 17.9  |
| 19    | .874                                            | .944                                      | .814    | .130    | 67.6                          | 77.5                                          | 58.4 | 19.1  |
| 20    | .909                                            | .969                                      | .863    | .106    | 67.0                          | 70.0                                          | 64.8 | 5.2   |
| 21    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 22    | .885                                            | .945                                      | .840    | .105    | 66.1                          | 75.1                                          | 59.4 | 15.7  |
| 23    | .916                                            | .981                                      | .865    | .116    | 64.8                          | 73.3                                          | 55.6 | 17.7  |
| 24    | .940                                            | 30.000                                    | .883    | .117    | 66.8                          | 76.8                                          | 58.2 | 18.6  |
| 25    | .994                                            | .062                                      | .957    | .05     | 69.6                          | 76.0                                          | 63.8 | 12.2  |
| 26    | 30.024                                          | .082                                      | .976    | .106    | 68.3                          | 71.6                                          | 65.6 | 6.0   |
| 27    | .004                                            | .093                                      | .930    | .163    | 65.8                          | 72.8                                          | 60.2 | 12.6  |
| 28    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 29    | .088                                            | .123                                      | .974    | .149    | 63.6                          | 72.6                                          | 56.8 | 15.8  |
| 30    | .028                                            | .098                                      | .956    | .142    | 63.5                          | 73.2                                          | 54.8 | 18.4  |
| 31    | .070                                            | .143                                      | 30.024  | .119    | 63.5                          | 73.4                                          | 54.8 | 18.6  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly Observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of December, 1862.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Date. | Mean Wet Bulb Thermo-<br>meter. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a Cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humidity,<br>complete saturation be-<br>ing unit. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------|
|       | °                               | °                   | °                   | °                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                  |
| 1     | 63.9                            | 6.8                 | 60.5                | 10.2                         | .532                             | 5.85                                             | 2.33                                                                    | .72                                                              |
| 2     | 62.4                            | 7.1                 | 58.8                | 10.7                         | .503                             | .53                                              | .35                                                                     | .70                                                              |
| 3     | 60.5                            | 7.0                 | 56.3                | 11.2                         | .462                             | .11                                              | .31                                                                     | .69                                                              |
| 4     | 63.3                            | 5.3                 | 60.6                | 8.0                          | .534                             | .88                                              | 1.79                                                                    | .77                                                              |
| 5     | 64.2                            | 5.1                 | 61.6                | 7.7                          | .552                             | 6.07                                             | .76                                                                     | .78                                                              |
| 6     | 62.6                            | 5.3                 | 59.4                | 8.5                          | .513                             | 5.66                                             | .85                                                                     | .75                                                              |
| 7     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                  |
| 8     | 59.5                            | 6.8                 | 55.4                | 10.9                         | .449                             | 4.97                                             | 2.18                                                                    | .70                                                              |
| 9     | 57.2                            | 6.4                 | 52.7                | 10.9                         | .409                             | .57                                              | .00                                                                     | .70                                                              |
| 10    | 58.0                            | 6.5                 | 54.1                | 10.4                         | .429                             | .78                                              | 1.98                                                                    | .71                                                              |
| 11    | 58.8                            | 6.2                 | 55.1                | 9.9                          | .444                             | .94                                              | .93                                                                     | .72                                                              |
| 12    | 59.3                            | 6.3                 | 55.5                | 10.1                         | .450                             | 5.00                                             | 2.00                                                                    | .71                                                              |
| 13    | 60.4                            | 5.2                 | 57.3                | 8.3                          | .478                             | .30                                              | 1.70                                                                    | .76                                                              |
| 14    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                  |
| 15    | 61.5                            | 5.8                 | 58.0                | 9.3                          | .489                             | .41                                              | .96                                                                     | .73                                                              |
| 16    | 60.0                            | 7.2                 | 55.7                | 11.5                         | .453                             | .01                                              | 2.34                                                                    | .68                                                              |
| 17    | 59.1                            | 7.0                 | 54.9                | 11.2                         | .441                             | 4.89                                             | .21                                                                     | .69                                                              |
| 18    | 58.2                            | 7.2                 | 53.9                | 11.5                         | .426                             | .73                                              | .22                                                                     | .68                                                              |
| 19    | 61.3                            | 6.3                 | 57.5                | 10.1                         | .481                             | 5.32                                             | .12                                                                     | .72                                                              |
| 20    | 62.2                            | 4.8                 | 59.3                | 7.7                          | .511                             | .65                                              | 1.65                                                                    | .77                                                              |
| 21    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                  |
| 22    | 59.5                            | 6.6                 | 55.5                | 10.6                         | .450                             | 4.99                                             | 2.11                                                                    | .70                                                              |
| 23    | 58.1                            | 6.7                 | 54.1                | 10.7                         | .429                             | .77                                              | .06                                                                     | .70                                                              |
| 24    | 60.9                            | 5.9                 | 57.4                | 9.4                          | .480                             | 5.31                                             | 1.95                                                                    | .73                                                              |
| 25    | 61.7                            | 7.9                 | 57.7                | 11.5                         | .485                             | .33                                              | 2.57                                                                    | .68                                                              |
| 26    | 61.1                            | 7.2                 | 56.8                | 11.5                         | .470                             | .18                                              | .42                                                                     | .68                                                              |
| 27    | 61.3                            | 4.5                 | 58.6                | 7.2                          | .499                             | .54                                              | 1.50                                                                    | .79                                                              |
| 28    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                  |
| 29    | 56.3                            | 7.3                 | 51.2                | 12.4                         | .389                             | 4.34                                             | 2.23                                                                    | .66                                                              |
| 30    | 56.4                            | 7.1                 | 51.4                | 12.1                         | .392                             | .37                                              | .18                                                                     | .67                                                              |
| 31    | 57.6                            | 5.9                 | 53.5                | 10.0                         | .421                             | .69                                              | .86                                                                     | .72                                                              |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of December, 1862.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fabt. | Range of the Barometer for<br>each hour during the<br>month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture for each hour<br>during the<br>month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|---------------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                                | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                                   | o    | o     |
| Mid-<br>night. | 29.968                                          | 30.063                                                       | 29.876  | 0.187   | 62.8                          | 68.4                                                                | 58.4 | 10.0  |
| 1              | .961                                            | .057                                                         | .868    | .189    | 62.3                          | 67.8                                                                | 58.0 | 9.8   |
| 2              | .952                                            | .049                                                         | .857    | .192    | 61.7                          | 67.4                                                                | 57.7 | 9.7   |
| 3              | .944                                            | .039                                                         | .855    | .184    | 61.1                          | 67.0                                                                | 57.0 | 10.0  |
| 4              | .945                                            | .033                                                         | .858    | .175    | 60.8                          | 66.6                                                                | 56.0 | 10.6  |
| 5              | .953                                            | .037                                                         | .856    | .181    | 60.2                          | 66.0                                                                | 55.6 | 10.4  |
| 6              | .962                                            | .051                                                         | .874    | .177    | 59.5                          | 66.0                                                                | 55.0 | 11.0  |
| 7              | .985                                            | .075                                                         | .894    | .181    | 59.4                          | 65.8                                                                | 54.8 | 11.0  |
| 8              | 30.010                                          | .105                                                         | .919    | .186    | 62.8                          | 67.6                                                                | 58.4 | 9.2   |
| 9              | .030                                            | .127                                                         | .944    | .183    | 61.8                          | 70.6                                                                | 58.0 | 12.6  |
| 10             | .032                                            | .143                                                         | .931    | .212    | 67.8                          | 73.4                                                                | 62.2 | 11.2  |
| 11             | .012                                            | .123                                                         | .907    | .216    | 70.8                          | 76.4                                                                | 65.6 | 10.8  |
| Noon.          | 29.981                                          | .100                                                         | .884    | .216    | 72.8                          | 77.8                                                                | 68.2 | 9.6   |
| 1              | .951                                            | .073                                                         | .847    | .226    | 74.3                          | 79.8                                                                | 69.8 | 10.0  |
| 2              | .926                                            | .049                                                         | .827    | .222    | 75.2                          | 79.4                                                                | 69.6 | 9.8   |
| 3              | .914                                            | .024                                                         | .814    | .210    | 75.1                          | 79.0                                                                | 70.0 | 9.0   |
| 4              | .912                                            | .025                                                         | .810    | .215    | 73.8                          | 77.8                                                                | 69.4 | 8.4   |
| 5              | .919                                            | .032                                                         | .808    | .224    | 71.9                          | 75.6                                                                | 68.3 | 7.3   |
| 6              | .930                                            | .038                                                         | .837    | .201    | 69.5                          | 72.7                                                                | 66.2 | 6.5   |
| 7              | .948                                            | .059                                                         | .851    | .208    | 67.7                          | 71.7                                                                | 64.0 | 7.7   |
| 8              | .966                                            | .093                                                         | .872    | .221    | 66.5                          | 70.7                                                                | 62.8 | 7.9   |
| 9              | .983                                            | .106                                                         | .896    | .210    | 65.4                          | 69.8                                                                | 60.8 | 9.0   |
| 10             | .983                                            | .118                                                         | .884    | .234    | 64.3                          | 69.4                                                                | 60.2 | 9.2   |
| 11             | .978                                            | .116                                                         | .878    | .238    | 63.5                          | 68.2                                                                | 59.8 | 8.4   |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the Observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations,  
taken at the Surveyor General's Office, Calcutta,  
in the month of December, 1862.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force<br>of Vapour. | Mean Weight of Va-<br>pour in a Cubic<br>foot of air. | Additional Weight of<br>Vapour required<br>for complete satu-<br>ration. | Mean degree of Hu-<br>midity, complete<br>saturation being<br>unity. |
|----------------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------|
|                | o                               | o                   | o                   | o                            | Inches.                          | Troy grs.                                             | Troy grs.                                                                |                                                                      |
| Mid-<br>night. | 59.1                            | 3.7                 | 56.5                | 6.3                          | 0.465                            | 5.20                                                  | 1.21                                                                     | 0.81                                                                 |
| 1              | 58.7                            | 3.6                 | 56.2                | 6.1                          | .461                             | .15                                                   | .16                                                                      | .82                                                                  |
| 2              | 58.0                            | 3.7                 | 55.4                | 6.3                          | .449                             | .02                                                   | .17                                                                      | .81                                                                  |
| 3              | 57.4                            | 3.7                 | 54.4                | 6.7                          | .434                             | 4.85                                                  | .23                                                                      | .80                                                                  |
| 4              | 57.2                            | 3.6                 | 54.3                | 6.5                          | .432                             | .84                                                   | .18                                                                      | .80                                                                  |
| 5              | 56.8                            | 3.4                 | 54.1                | 6.1                          | .429                             | .82                                                   | .09                                                                      | .82                                                                  |
| 6              | 56.2                            | 3.3                 | 53.6                | 5.9                          | .422                             | .74                                                   | .04                                                                      | .82                                                                  |
| 7              | 56.1                            | 3.3                 | 53.5                | 5.9                          | .421                             | .73                                                   | .03                                                                      | .82                                                                  |
| 8              | 57.4                            | 5.4                 | 53.6                | 9.2                          | .422                             | .71                                                   | .70                                                                      | .74                                                                  |
| 9              | 58.8                            | 6.0                 | 55.2                | 9.6                          | .445                             | .95                                                   | .88                                                                      | .73                                                                  |
| 10             | 60.2                            | 7.6                 | 55.6                | 12.2                         | .452                             | 5.00                                                  | 2.48                                                                     | .67                                                                  |
| 11             | 61.5                            | 9.3                 | 56.8                | 14.0                         | .470                             | .16                                                   | 3.04                                                                     | .63                                                                  |
| Noon.          | 62.3                            | 10.5                | 57.0                | 15.8                         | .473                             | .17                                                   | .54                                                                      | .59                                                                  |
| 1              | 62.8                            | 11.5                | 57.0                | 17.3                         | .473                             | .16                                                   | .96                                                                      | .57                                                                  |
| 2              | 63.3                            | 11.9                | 57.3                | 17.9                         | .478                             | .20                                                   | 4.17                                                                     | .56                                                                  |
| 3              | 63.0                            | 12.1                | 56.9                | 18.2                         | .472                             | .13                                                   | .21                                                                      | .55                                                                  |
| 4              | 62.8                            | 11.0                | 57.3                | 16.5                         | .478                             | .21                                                   | 3.77                                                                     | .58                                                                  |
| 5              | 63.1                            | 8.8                 | 58.7                | 13.2                         | .501                             | .49                                                   | 2.99                                                                     | .65                                                                  |
| 6              | 63.1                            | 6.4                 | 59.9                | 9.6                          | .521                             | .73                                                   | .15                                                                      | .73                                                                  |
| 7              | 62.4                            | 5.3                 | 59.2                | 8.5                          | .509                             | .63                                                   | 1.83                                                                     | .76                                                                  |
| 8              | 61.7                            | 4.8                 | 58.8                | 7.7                          | .503                             | .56                                                   | .63                                                                      | .77                                                                  |
| 9              | 61.0                            | 4.4                 | 58.4                | 7.0                          | .496                             | .50                                                   | .45                                                                      | .79                                                                  |
| 10             | 60.4                            | 3.9                 | 57.7                | 6.6                          | .485                             | .38                                                   | .34                                                                      | .80                                                                  |
| 11             | 59.8                            | 3.7                 | 57.2                | 6.3                          | .476                             | .31                                                   | .24                                                                      | .81                                                                  |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of December, 1862.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                          |
|-------|-----------------------|---------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------|
|       | 0                     | Inches                          |                                   |                                                                                                     |
| 1     | 139.0                 | ...                             | N. W. & N. & W.                   | Cloudless; also slightly foggy from Midnight to 5 A. M. & also after 9 P. M.                        |
| 2     | 134.8                 | ...                             | N.                                | Cloudless; also slightly foggy after 8 P. M.                                                        |
| 3     | 135.8                 | ...                             | N.                                | Cloudless; also slightly foggy after 8 P. M.                                                        |
| 4     | 136.0                 | ...                             | N. W. & N.                        | Cloudless till 11 A. M. Scatd. \i & \i till 5 P. M. cloudless afterwards.                           |
| 5     | 137.4                 | ...                             | W. & N.                           | Cloudless.                                                                                          |
| 6     | 134.0                 | ...                             | W. & N. E. & N. W.                | Cloudless.                                                                                          |
| 7     | ...                   | ...                             | Sunday.                           |                                                                                                     |
| 8     | 132.0                 | ...                             | N. & N. W.                        | Cloudless.                                                                                          |
| 9     | 133.0                 | ...                             | N. W. & N.                        | Cloudless.                                                                                          |
| 10    | 136.4                 | ...                             | N.                                | Cloudless; also slightly foggy from 8 to 10 P. M.                                                   |
| 11    | 137.0                 | ...                             | N.                                | Cloudless; also foggy after 9 P. M.                                                                 |
| 12    | 138.0                 | ...                             | N. & N. W.                        | Cloudless; also slightly foggy from Midnight to 6 A. M. & also after 8 P. M.                        |
| 13    | 131.4                 | ...                             | N.                                | Cloudless; also foggy at Midnight and 1 A. M.                                                       |
| 14    | ...                   | ...                             | Sunday.                           |                                                                                                     |
| 15    | 127.4                 | ...                             | N.                                | Cloudless.                                                                                          |
| 16    | 131.0                 | ...                             | N. & N. W.                        | Cloudless.                                                                                          |
| 17    | 137.0                 | ...                             | N. & N. W.                        | Cloudless.                                                                                          |
| 18    | 134.8                 | ...                             | N.                                | Cloudless.                                                                                          |
| 19    | 134.0                 | ...                             | N.                                | Cloudless till 1 P. M. cloudy afterwards.                                                           |
| 20    | ...                   | ...                             | S. W. & N. & N. W.                | Scatd. \i till 3 A. M. cloudy afterwards; also drizzled at 7 P. M.                                  |
| 21    | ...                   | ...                             | Sunday.                           |                                                                                                     |
| 22    | 137.2                 | ...                             | N.                                | Cloudless; also foggy from Midnight to 2 A. M.                                                      |
| 23    | 134.0                 | ...                             | N.                                | Cloudless till 2 P. M. Scatd. \i afterwards.                                                        |
| 24    | 137.0                 | ...                             | N.                                | Cloudless.                                                                                          |
| 25    | 135.0                 | ...                             | N. W. & N.                        | Cloudy.                                                                                             |
| 26    | ...                   | ...                             | N. & N. W.                        | Cloudy; also drizzling at 5, 7 & 8 P. M.                                                            |
| 27    | ...                   | 0.20                            | N. & N. W.                        | Cloudy till 5 P. M. cloudless afterwards; also drizzling from 1 to 7 A. M. also foggy after 7 P. M. |
| 28    | ...                   | ...                             | Sunday.                           |                                                                                                     |
| 29    | 132.0                 | ...                             | E. & N. & N. W.                   | Cloudless; also foggy after 7 P. M.                                                                 |
| 30    | 130.0                 | ...                             | N. & N. E.                        | Cloudless.                                                                                          |
| 31    | 131.7                 | ...                             | N.                                | Cloudless.                                                                                          |

\i Cirri, \i Cirro strati, \i Cumuli, \i Cumulo strati, \i Nimbi, —i Strati, \i Cirro cumuli.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of December, 1862.*

## MONTHLY RESULTS.

|                                                                |    |    | Inches |
|----------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month,                    | .. | .. | 29.964 |
| Max. height of the Barometer occurred at 10 A. M. on the 31st, | .. | .. | 30.143 |
| Min. height of the Barometer occurred at 5 P. M. on the 18th,  | .. | .. | 29.808 |
| Extreme range of the Barometer during the month,               | .. | .. | 0.335  |
| Mean of the daily Max. Pressures,                              | .. | .. | 30.034 |
| Ditto ditto Min. ditto,                                        | .. | .. | 29.907 |
| Mean daily range of the Barometer during the month,            | .. | .. | 0.127  |

|                                                            |    |    | °    |
|------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                   | .. | .. | 66.5 |
| Max. Temperature occurred at 1 P. M. on the 1st,           | .. | .. | 79.8 |
| Min. Temperature occurred at 7 A. M. on the 30th and 31st, | .. | .. | 54.8 |
| Extreme range of the Temperature during the month,         | .. | .. | 25.0 |
| Mean of the daily Max. Temperature,                        | .. | .. | 75.4 |
| Ditto ditto Min. ditto,                                    | .. | .. | 59.2 |
| Mean daily range of the Temperature during the month,      | .. | .. | 16.2 |

|                                                            |    |    | °    |
|------------------------------------------------------------|----|----|------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 60.2 |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 6.3  |
| Computed Mean Dew-point for the month,                     | .. | .. | 56.4 |
| Mean Dry Bulb Thermometer above computed Mean Dew-point,   | .. | .. | 10.1 |

|                                             |    |    | Inches |
|---------------------------------------------|----|----|--------|
| Mean Elastic force of Vapour for the month, | .. | .. | 0.464  |

|                                                                         |    |    | Troy grains |
|-------------------------------------------------------------------------|----|----|-------------|
| Mean Weight of Vapour for the month,                                    | .. | .. | 5.14        |
| Additional Weight of Vapour required for complete saturation,           | .. | .. | 2.05        |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.72        |

|                                                   |    |    | Inches     |
|---------------------------------------------------|----|----|------------|
| Rained 3 days, Max. fall of rain during 24 hours, | .. | .. | 0.20       |
| Total amount of rain during the month,            | .. | .. | 0.20       |
| Prevailing direction of the Wind,                 | .. | .. | N. & N. W. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of December, 1862.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on.<br>N. E. | Rain on.<br>E. | Rain on.<br>S. E. | Rain on.<br>S. | Rain on.<br>S. W. | Rain on.<br>W. | Rain on.<br>N. W. | Rain on.<br>Calm. | Rain on. | Missed. |
|-----------|--------------|-------------------|----------------|-------------------|----------------|-------------------|----------------|-------------------|-------------------|----------|---------|
|           | No. of days. |                   |                |                   |                |                   |                |                   |                   |          |         |
| Midnight. | 17           |                   |                |                   |                |                   |                | 5                 |                   |          | 1       |
| 1         | 18           |                   |                |                   |                |                   |                | 5                 | 1                 |          |         |
| 2         | 16           |                   |                |                   |                |                   |                | 6                 | 1                 |          |         |
| 3         | 14           |                   |                |                   |                |                   |                | 6                 | 1                 |          | 3       |
| 4         | 14           | 1                 |                |                   |                |                   |                | 6                 | 1                 |          | 2       |
| 5         | 13           | 1                 |                |                   |                |                   |                | 5                 | 1                 |          | 4       |
| 6         | 17           | 2                 |                |                   |                |                   |                | 5                 | 1                 |          |         |
| 7         | 16           | 2                 |                |                   |                |                   |                | 6                 | 1                 |          |         |
| 8         | 11           | 1                 | 2              |                   | 1              |                   |                | 4                 |                   |          | 5       |
| 9         | 17           | 2                 | 2              |                   |                | 2                 |                | 3                 |                   |          |         |
| 10        | 18           | 3                 |                |                   |                | 1                 |                | 4                 |                   |          |         |
| 11        | 16           | 3                 |                |                   |                | 1                 |                | 6                 |                   |          |         |
| Noon.     | 17           | 1                 |                |                   |                |                   |                | 8                 |                   |          |         |
| 1         | 16           | 2                 |                |                   |                |                   |                | 8                 |                   |          |         |
| 2         | 17           | 4                 |                |                   |                |                   |                | 6                 |                   |          |         |
| 3         | 16           | 2                 |                |                   |                |                   |                | 8                 |                   |          |         |
| 4         | 19           | 1                 |                |                   |                | 2                 |                | 4                 |                   |          |         |
| 5         | 19           | 1                 | 1              |                   |                | 1                 |                | 5                 |                   |          |         |
| 6         | 20           | 1                 | 1              |                   |                | 1                 |                | 4                 |                   |          |         |
| 7         | 19           | 1                 | 1              |                   |                | 1                 | 1              | 4                 |                   |          |         |
| 8         | 19           | 1                 | 1              |                   |                | 1                 | 1              | 4                 |                   |          |         |
| 9         | 17           | 1                 | 1              |                   |                | 1                 | 1              | 5                 |                   |          | 1       |
| 10        | 17           | 1                 |                |                   |                | 1                 | 1              | 5                 |                   |          | 1       |
| 11        | 18           | 1                 | 1              |                   |                | 1                 | 1              | 5                 |                   |          |         |



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of January, 1863.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.

Height of the Cistern of the Standard Barometer above the Sea-level, 18.11.

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches                                          | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 30.060                                          | 30.135                                    | 29.985  | 0.150   | 68.5                          | 79.6                                          | 59.3 | 20.3  |
| 2     | .030                                            | .113                                      | .985    | .128    | 70.3                          | 79.9                                          | 61.8 | 18.1  |
| 3     | .050                                            | .134                                      | .991    | .143    | 69.7                          | 78.5                                          | 63.8 | 14.7  |
| 4     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 5     | .057                                            | .151                                      | .989    | .162    | 66.6                          | 75.4                                          | 59.6 | 15.8  |
| 6     | .009                                            | .077                                      | .955    | .122    | 65.2                          | 74.0                                          | 57.4 | 16.6  |
| 7     | .042                                            | .128                                      | .994    | .134    | 65.3                          | 75.8                                          | 57.2 | 18.6  |
| 8     | .047                                            | .123                                      | .984    | .139    | 65.5                          | 76.0                                          | 56.4 | 19.6  |
| 9     | .042                                            | .113                                      | .998    | .115    | 65.2                          | 76.4                                          | 58.0 | 18.4  |
| 10    | .073                                            | .165                                      | 30.019  | .146    | 65.3                          | 74.0                                          | 58.3 | 15.7  |
| 11    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 12    | .068                                            | .158                                      | .006    | .152    | 63.8                          | 75.1                                          | 54.9 | 20.2  |
| 13    | 29.996                                          | .072                                      | 29.919  | .153    | 65.0                          | 76.2                                          | 54.8 | 21.4  |
| 14    | 30.012                                          | .072                                      | .954    | .118    | 68.6                          | 78.4                                          | 59.8 | 18.6  |
| 15    | .054                                            | .138                                      | 30.008  | .130    | 67.3                          | 76.4                                          | 60.8 | 15.6  |
| 16    | .035                                            | .122                                      | 29.978  | .144    | 68.9                          | 79.4                                          | 59.8 | 19.6  |
| 17    | .028                                            | .090                                      | .981    | .109    | 67.5                          | 71.0                                          | 64.4 | 6.6   |
| 18    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 19    | .070                                            | .153                                      | 30.013  | .140    | 68.9                          | 78.4                                          | 60.0 | 18.4  |
| 20    | .051                                            | .142                                      | 29.995  | .147    | 68.6                          | 76.4                                          | 62.4 | 14.0  |
| 21    | .042                                            | .101                                      | .997    | .104    | 70.6                          | 78.8                                          | 63.3 | 15.5  |
| 22    | .103                                            | .164                                      | 30.050  | .114    | 70.7                          | 79.5                                          | 62.3 | 17.2  |
| 23    | .027                                            | .104                                      | 29.953  | .151    | 71.2                          | 79.6                                          | 63.0 | 16.6  |
| 24    | 29.991                                          | .051                                      | .938    | .113    | 69.0                          | 74.3                                          | 64.6 | 9.7   |
| 25    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 26    | 30.105                                          | .189                                      | 30.043  | .146    | 67.9                          | 76.4                                          | 60.2 | 16.2  |
| 27    | .086                                            | .177                                      | .019    | .158    | 65.6                          | 75.2                                          | 59.0 | 16.2  |
| 28    | .032                                            | .120                                      | 29.964  | .156    | 65.5                          | 75.2                                          | 56.4 | 18.8  |
| 29    | .031                                            | .102                                      | .982    | .120    | 65.2                          | 75.2                                          | 56.2 | 19.0  |
| 30    | .009                                            | .099                                      | .922    | .177    | 65.4                          | 76.6                                          | 55.5 | 21.1  |
| 31    | .006                                            | .074                                      | .950    | .124    | 65.5                          | 74.6                                          | 57.6 | 17.0  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly Observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of January, 1863.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Date. | Mean Wet Bulb Thermometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew Point. | Mean Elastic force of Vapour. | Mean Weight of Vapour in a Cubic foot of air. | Additional Weight of Vapour required for complete saturation. | Mean degree of Humidity, complete saturation being unity. |
|-------|----------------------------|---------------------|---------------------|---------------------------|-------------------------------|-----------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------|
|       | °                          | °                   | °                   | °                         | Inches.                       | T. gr.                                        | T. gr.                                                        |                                                           |
| 1     | 61.9                       | 6.6                 | 56.6                | 11.9                      | .467                          | 5.15                                          | 2.50                                                          | .67                                                       |
| 2     | 63.3                       | 7.0                 | 57.7                | 12.6                      | .485                          | .32                                           | .76                                                           | .66                                                       |
| 3     | 63.1                       | 6.6                 | 57.8                | 11.9                      | .486                          | .35                                           | .58                                                           | .68                                                       |
| 4     | Sunday.                    |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 5     | 60.0                       | 6.6                 | 54.7                | 11.9                      | .438                          | 4.85                                          | .36                                                           | .67                                                       |
| 6     | 58.9                       | 6.3                 | 53.9                | 11.3                      | .426                          | .74                                           | .17                                                           | .69                                                       |
| 7     | 58.9                       | 6.4                 | 53.8                | 11.5                      | .425                          | .71                                           | .22                                                           | .68                                                       |
| 8     | 59.0                       | 6.5                 | 53.8                | 11.7                      | .425                          | .71                                           | .27                                                           | .68                                                       |
| 9     | 59.2                       | 6.0                 | 54.4                | 10.8                      | .434                          | .81                                           | .10                                                           | .70                                                       |
| 10    | 58.4                       | 6.9                 | 52.9                | 12.4                      | .412                          | .59                                           | .34                                                           | .66                                                       |
| 11    | Sunday.                    |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 12    | 57.3                       | 6.5                 | 51.4                | 12.4                      | .392                          | .37                                           | .24                                                           | .66                                                       |
| 13    | 58.9                       | 6.1                 | 54.0                | 11.0                      | .428                          | .75                                           | .12                                                           | .69                                                       |
| 14    | 63.8                       | 4.8                 | 60.0                | 8.6                       | .523                          | 5.76                                          | 1.91                                                          | .75                                                       |
| 15    | 63.4                       | 3.9                 | 60.3                | 7.0                       | .528                          | .85                                           | .52                                                           | .79                                                       |
| 16    | 63.3                       | 5.6                 | 58.8                | 10.1                      | .503                          | .54                                           | 2.20                                                          | .72                                                       |
| 17    | 64.3                       | 3.2                 | 61.7                | 5.8                       | .554                          | 6.12                                          | 1.30                                                          | .83                                                       |
| 18    | Sunday.                    |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 19    | 62.3                       | 6.6                 | 57.0                | 11.9                      | .473                          | 5.21                                          | 2.53                                                          | .67                                                       |
| 20    | 65.0                       | 3.6                 | 62.1                | 6.5                       | .561                          | 6.18                                          | 1.49                                                          | .81                                                       |
| 21    | 64.1                       | 6.5                 | 58.9                | 11.7                      | .504                          | 5.53                                          | 2.62                                                          | .68                                                       |
| 22    | 64.2                       | 6.5                 | 59.0                | 11.7                      | .506                          | .55                                           | .63                                                           | .68                                                       |
| 23    | 65.9                       | 5.3                 | 61.7                | 9.5                       | .554                          | 6.07                                          | .23                                                           | .73                                                       |
| 24    | 63.3                       | 5.7                 | 58.7                | 10.3                      | .501                          | 5.53                                          | .23                                                           | .71                                                       |
| 25    | Sunday.                    |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 26    | 61.0                       | 6.9                 | 55.5                | 12.4                      | .450                          | 4.98                                          | .53                                                           | .66                                                       |
| 27    | 59.0                       | 6.6                 | 53.7                | 11.9                      | .423                          | .70                                           | .30                                                           | .67                                                       |
| 28    | 58.6                       | 6.9                 | 53.1                | 12.4                      | .415                          | .62                                           | .36                                                           | .66                                                       |
| 29    | 58.2                       | 7.0                 | 52.6                | 12.6                      | .408                          | .53                                           | .38                                                           | .66                                                       |
| 30    | 58.5                       | 6.9                 | 53.0                | 12.4                      | .414                          | .60                                           | .35                                                           | .66                                                       |
| 31    | 59.4                       | 6.1                 | 54.5                | 11.0                      | .435                          | .83                                           | .15                                                           | .69                                                       |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January 1863, the Greenwich New Factors have been used  
for, computing Dew-point.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of January, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Feh. | Range of the Barometer for<br>each hour during the<br>month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture for each hour<br>during the<br>month. |      |       |
|----------------|------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|---------------------------------------------------------------------|------|-------|
|                |                                                | Max.                                                         | Min.    | Diff.   |                               | Max.                                                                | Min. | Diff. |
|                | Inches.                                        | Inches.                                                      | Inches. | Inches. | o                             | o                                                                   | o    | o     |
| Mid-<br>night. | 30.043                                         | 30.104                                                       | 29.951  | 0.153   | 63.5                          | 68.6                                                                | 58.6 | 10.0  |
| 1              | .039                                           | .101                                                         | .944    | .157    | 62.7                          | 68.2                                                                | 58.0 | 10.2  |
| 2              | .031                                           | .095                                                         | .938    | .157    | 62.1                          | 67.5                                                                | 57.4 | 10.1  |
| 3              | .025                                           | .086                                                         | .938    | .148    | 61.6                          | 66.8                                                                | 57.0 | 9.8   |
| 4              | .021                                           | .084                                                         | .955    | .129    | 61.2                          | 66.2                                                                | 56.0 | 10.2  |
| 5              | .027                                           | .086                                                         | .969    | .117    | 59.9                          | 65.6                                                                | 55.6 | 10.0  |
| 6              | .044                                           | .105                                                         | .954    | .151    | 59.9                          | 65.0                                                                | 55.1 | 9.9   |
| 7              | .065                                           | .134                                                         | .992    | .142    | 59.6                          | 64.8                                                                | 54.8 | 10.0  |
| 8              | .097                                           | .157                                                         | 30.024  | .133    | 63.0                          | 67.4                                                                | 59.0 | 8.4   |
| 9              | .113                                           | .174                                                         | .047    | .127    | 65.5                          | 69.6                                                                | 62.6 | 7.0   |
| 10             | .120                                           | .189                                                         | .051    | .138    | 68.4                          | 72.2                                                                | 65.4 | 6.8   |
| 11             | .100                                           | .181                                                         | .033    | .143    | 71.3                          | 74.9                                                                | 68.4 | 6.5   |
| Noon.          | .072                                           | .152                                                         | .010    | .142    | 73.6                          | 78.2                                                                | 70.2 | 8.0   |
| 1              | .040                                           | .112                                                         | 29.983  | .129    | 74.9                          | 79.4                                                                | 70.4 | 9.0   |
| 2              | .016                                           | .098                                                         | .964    | .134    | 76.0                          | 79.6                                                                | 70.4 | 9.2   |
| 3              | 29.998                                         | .085                                                         | .933    | .152    | 76.5                          | 79.9                                                                | 71.0 | 8.9   |
| 4              | .991                                           | .067                                                         | .928    | .139    | 75.3                          | 79.2                                                                | 71.0 | 8.2   |
| 5              | .996                                           | .090                                                         | .922    | .168    | 73.0                          | 76.6                                                                | 69.4 | 7.2   |
| 6              | 30.001                                         | .095                                                         | .919    | .176    | 70.9                          | 75.2                                                                | 66.8 | 8.4   |
| 7              | .014                                           | .111                                                         | .933    | .178    | 69.1                          | 73.4                                                                | 64.8 | 8.6   |
| 8              | .032                                           | .118                                                         | .972    | .146    | 67.9                          | 72.1                                                                | 63.4 | 8.7   |
| 9              | .043                                           | .120                                                         | .968    | .152    | 66.7                          | 71.4                                                                | 62.2 | 9.2   |
| 10             | .043                                           | .119                                                         | .962    | .157    | 65.6                          | 70.4                                                                | 60.8 | 9.6   |
| 11             | .047                                           | .110                                                         | .953    | .157    | 64.6                          | 69.3                                                                | 59.6 | 9.7   |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the Observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of January, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Hour.          | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force<br>of Vapour. | Mean Weight of Va-<br>pour in a Cubic<br>foot of air. | Additional Weight of<br>Vapour required<br>for complete satu-<br>ration. | Mean degree of Hu-<br>midity, complete<br>saturation being<br>unity. |
|----------------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------|
|                | o                               | o                   | o                   | o                            | Inches.                          | Troy grs.                                             | Troy grs.                                                                |                                                                      |
| Mid-<br>night. | 60.1                            | 8.4                 | 57.0                | 6.5                          | .0473                            | 5.27                                                  | 1.28                                                                     | 0.81                                                                 |
| 1              | 59.3                            | 8.4                 | 56.2                | 6.5                          | .461                             | .14                                                   | .25                                                                      | .80                                                                  |
| 2              | 58.8                            | 8.3                 | 55.8                | 6.3                          | .455                             | .09                                                   | .18                                                                      | .81                                                                  |
| 3              | 58.5                            | 8.1                 | 55.7                | 5.9                          | .453                             | .07                                                   | .10                                                                      | .82                                                                  |
| 4              | 58.1                            | 8.1                 | 55.3                | 5.9                          | .447                             | .01                                                   | .09                                                                      | .82                                                                  |
| 5              | 56.9                            | 8.0                 | 54.2                | 5.7                          | .431                             | 4.83                                                  | .02                                                                      | .83                                                                  |
| 6              | 57.0                            | 2.9                 | 54.4                | 5.5                          | .434                             | .86                                                   | 0.99                                                                     | .83                                                                  |
| 7              | 56.8                            | 2.8                 | 54.3                | 5.3                          | .432                             | .86                                                   | .94                                                                      | .84                                                                  |
| 8              | 58.6                            | 4.4                 | 54.6                | 8.4                          | .437                             | .88                                                   | 1.57                                                                     | .76                                                                  |
| 9              | 60.0                            | 5.5                 | 55.6                | 9.9                          | .452                             | 5.02                                                  | .96                                                                      | .72                                                                  |
| 10             | 61.4                            | 7.0                 | 55.8                | 12.6                         | .455                             | .02                                                   | 2.60                                                                     | .66                                                                  |
| 11             | 62.8                            | 8.5                 | 56.0                | 15.3                         | .458                             | .02                                                   | 3.31                                                                     | .60                                                                  |
|                |                                 |                     |                     |                              |                                  |                                                       |                                                                          |                                                                      |
| Noon.          | 63.4                            | 10.2                | 56.3                | 17.3                         | .462                             | .05                                                   | .88                                                                      | .57                                                                  |
| 1              | 64.1                            | 10.8                | 56.5                | 18.4                         | .465                             | .07                                                   | 4.21                                                                     | .55                                                                  |
| 2              | 64.4                            | 11.6                | 56.3                | 19.7                         | .462                             | .02                                                   | .58                                                                      | .52                                                                  |
| 3              | 64.6                            | 11.9                | 56.3                | 20.2                         | .462                             | .02                                                   | .73                                                                      | .52                                                                  |
| 4              | 64.1                            | 11.2                | 56.3                | 19.0                         | .462                             | .03                                                   | .37                                                                      | .54                                                                  |
| 5              | 64.2                            | 8.8                 | 57.2                | 15.8                         | .476                             | .20                                                   | 3.56                                                                     | .59                                                                  |
| 6              | 64.4                            | 6.5                 | 59.2                | 11.7                         | .509                             | 5.59                                                  | 2.64                                                                     | .68                                                                  |
| 7              | 63.6                            | 5.5                 | 59.2                | 9.9                          | .509                             | .62                                                   | .16                                                                      | .72                                                                  |
| 8              | 62.9                            | 5.0                 | 58.9                | 9.0                          | .504                             | .57                                                   | 1.94                                                                     | .74                                                                  |
| 9              | 62.3                            | 4.4                 | 58.8                | 7.9                          | .503                             | .56                                                   | .67                                                                      | .77                                                                  |
| 10             | 61.6                            | 4.0                 | 58.4                | 7.2                          | .496                             | .50                                                   | .50                                                                      | .79                                                                  |
| 11             | 61.1                            | 3.5                 | 58.3                | 6.3                          | .494                             | .49                                                   | .29                                                                      | .81                                                                  |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January 1863, the Greenwich New Factors have been used  
for, computing Dew-point.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of January, 1863.*

Solar Radiation, Weather, &c.

| DATE. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                          |
|-------|-----------------------|---------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------|
|       | °                     | Inches                          |                                   |                                                                                                     |
| 1     | 139.6                 | ...                             | N.                                | Cloudless till 4 P. M. Scatd. \i afterwards.                                                        |
| 2     | 140.9                 | ...                             | N.                                | Scatd. \i till 10 A. M. cloudless till 5 P. M. Scatd. \i afterwards.                                |
| 3     | 134.0                 | ...                             | N.                                | Scatd. \i till 7 A. M. cloudless afterwards; also slightly foggy after 8 P. M.                      |
| 4     | ...                   | ...                             | Sunday.                           |                                                                                                     |
| 5     | 134.0                 | ...                             | N.                                | Cloudless.                                                                                          |
| 6     | 129.0                 | ...                             | N.                                | Cloudless; also slightly foggy after 7 P. M.                                                        |
| 7     | 131.0                 | ...                             | N.                                | Cloudless; also slightly foggy after 9 P. M.                                                        |
| 8     | 134.0                 | ...                             | N.                                | Cloudless; also foggy between Mid-night & 7 A. M.                                                   |
| 9     | 134.0                 | ...                             | N.                                | Cloudless.                                                                                          |
| 10    | 139.0                 | ...                             | N. & W.                           | Cloudless.                                                                                          |
| 11    | ...                   | ...                             | Sunday.                           |                                                                                                     |
| 12    | 133.4                 | ...                             | N. & N. W.                        | Cloudless.                                                                                          |
| 13    | 134.0                 | ...                             | S. & N.                           | Cloudless till 5 A. M. Scatd. \i and \i till 1 P. M. cloudless afterwards.                          |
| 14    | 132.0                 | ...                             | S. & N. & S. W.                   | Cloudless till 7 A. M. Scatd. \i and \i till 3 P. M. cloudless afterwards.                          |
| 15    | 126.2                 | ...                             | S. & E.                           | Cloudless till 10 A. M. Scatd. \i till 2 P. M. cloudless afterwards; also foggy between 4 & 7 A. M. |
| 16    | 134.0                 | ...                             | N. & S.                           | Cloudless; also foggy between 4 and 7 A. M.                                                         |
| 17    | ...                   | ...                             | S. & N. W.                        | Scatd. \i till 5 A. M. cloudy till 7 P. M. Scatd. \i afterwards; also slightly drizzled at 3 P. M.  |
| 18    | ...                   | ...                             | Sunday.                           |                                                                                                     |
| 19    | 134.0                 | ...                             | N. & S. W. & E.                   | Cloudless.                                                                                          |
| 20    | 121.2                 | ...                             | S. & S. W.                        | Cloudless till 7 A. M. Scatd. \i till 4 P. M. cloudless afterwards.                                 |
| 21    | 132.0                 | ...                             | N. & E.                           | Scatd. \i & \i till 7 A. M. cloudless afterwards.                                                   |
| 22    | 135.0                 | ...                             | N.                                | Cloudless; also foggy at 9 P. M.                                                                    |
| 23    | 132.0                 | ...                             | N. & W.                           | Cloudless.                                                                                          |
| 24    | ...                   | ...                             | N. & S.                           | Cloudless till 7 A. M. cloudy till 3 P. M. cloudless till 7 P. M. Scatd. \i afterwards.             |
| 25    | ...                   | ...                             | Sunday.                           |                                                                                                     |
| 26    | 132.0                 | ...                             | N.                                | Cloudless; also slightly foggy after 8 P. M.                                                        |

\i Cirri, \i Cirro strati, \i Cumuli, \i Cumulo strati, \i Nimbi, —i Strati  
\i Cirro cumuli.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of January, 1863.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge<br>5 feet above<br>Ground. | Prevailing direction<br>of the Wind. | General Aspect of the Sky.                                                 |
|-------|-----------------------|---------------------------------------|--------------------------------------|----------------------------------------------------------------------------|
|       | °                     | Inches.                               |                                      |                                                                            |
| 27    | 128.0                 | ..                                    | N. & W.                              | Cloudless; also slightly foggy between<br>7 & 10 P. M.                     |
| 28    | 131.2                 | ..                                    | N.                                   | Cloudless.                                                                 |
| 29    | 129.2                 | ..                                    | N. & N. W.                           | Cloudless.                                                                 |
| 30    | 132.8                 | ..                                    | N. & N. W.                           | Cloudless; also foggy after 7 P. M.                                        |
| 31    | 126.4                 | ..                                    | W. & N. & S. W.                      | Cloudless till 5 A. M. Scatd. clouds till<br>4 P. M. cloudless afterwards. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of January, 1863.*

MONTHLY RESULTS.

|                                                                |    |    | Inches |
|----------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month,                    | .. | .. | 30.043 |
| Max. height of the Barometer occurred at 10 A. M. on the 26th, | .. | .. | 30.189 |
| Min. height of the Barometer occurred at 6 P. M. on the 13th,  | .. | .. | 29.919 |
| <i>Extreme range</i> of the Barometer during the month,        | .. | .. | 0.270  |
| Mean of the daily Max. Pressures,                              | .. | .. | 30.121 |
| Ditto ditto Min. ditto,                                        | .. | .. | 29.984 |
| <i>Mean daily range</i> of the Barometer during the month,     | .. | .. | 0.137  |

|                                                              |    |    | °    |
|--------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                     | .. | .. | 67.3 |
| Max. Temperature occurred at 3 P. M. on the 2nd,             | .. | .. | 79.9 |
| Min. Temperature occurred at 7 A. M. on the 13th,            | .. | .. | 54.8 |
| <i>Extreme range</i> of the Temperature during the month,    | .. | .. | 25.1 |
| Mean of the daily Max. Temperature,                          | .. | .. | 76.5 |
| Ditto ditto Min. ditto,                                      | .. | .. | 59.5 |
| <i>Mean daily range</i> of the Temperature during the month, | .. | .. | 17.0 |

|                                                            |    |    | °      |
|------------------------------------------------------------|----|----|--------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 61.2   |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 6.1    |
| Computed Mean Dew-point for the month,                     | .. | .. | 56.3   |
| Mean Dry Bulb Thermometer above computed Mean Dew-point,   | .. | .. | 11.0   |
|                                                            |    |    | Inches |
| Mean Elastic force of Vapour for the month,                | .. | .. | 0.462  |

|                                                                         |    |    | Troy grains |
|-------------------------------------------------------------------------|----|----|-------------|
| Mean Weight of Vapour for the month,                                    | .. | .. | 5.11        |
| Additional Weight of Vapour required for complete saturation,           | .. | .. | 2.26        |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.69        |

|                                                    |    |    | Inches |
|----------------------------------------------------|----|----|--------|
| Drizzled 1 day, Max. fall of rain during 24 hours, | .. | .. | Nil.   |
| Total amount of rain during the month,             | .. | .. | Nil.   |
| Prevailing direction of the Wind,                  | .. | .. | N.     |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of January, 1863.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.        | N. | Rain on.<br>N. E.<br>R. | S. E. | S. | Rain on. | S. W. | Rain on. | W. | Rain on. | N. W. | Rain on. | Calm. | Rain on. |
|--------------|----|-------------------------|-------|----|----------|-------|----------|----|----------|-------|----------|-------|----------|
| No. of days. |    |                         |       |    |          |       |          |    |          |       |          |       |          |
| Midnight.    | 19 |                         | 1     |    | 2        |       |          |    | 1        |       | 1        |       |          |
| 1            | 20 |                         | 1     |    | 3        |       |          |    | 1        |       | 2        |       |          |
| 2            | 20 |                         | 1     |    | 3        |       |          |    | 1        |       | 2        |       |          |
| 3            | 18 |                         |       |    | 3        |       |          |    | 1        |       | 2        |       |          |
| 4            | 17 |                         |       |    | 3        |       |          |    | 1        |       | 2        |       |          |
| 5            | 15 |                         |       |    | 3        |       |          |    |          |       | 2        |       |          |
| 6            | 20 |                         |       |    | 2        |       |          |    | 2        |       | 2        |       |          |
| 7            | 20 |                         |       |    | 2        |       |          |    | 2        |       | 1        |       |          |
| 8            | 14 |                         |       |    | 5        |       |          |    | 2        |       |          |       |          |
| 9            | 15 |                         |       |    | 7        |       |          |    | 3        |       |          |       |          |
| 10           | 15 |                         |       |    | 4        |       | 1        |    | 2        |       |          |       |          |
| 11           | 13 |                         |       |    | 3        |       | 1        |    | 3        |       | 1        |       |          |
| Noon.        | 7  |                         |       |    |          |       | 3        |    | 5        |       | 5        |       |          |
| 1            | 7  |                         |       |    | 1        |       | 3        |    | 6        |       | 7        |       |          |
| 2            | 10 |                         |       |    | 1        |       | 2        |    | 5        |       | 6        |       |          |
| 3            | 13 |                         |       |    |          |       | 3        |    | 3        | 1     | 5        |       |          |
| 4            | 13 |                         |       |    | 3        |       | 2        |    | 3        |       | 4        |       |          |
| 5            | 13 |                         |       |    | 3        |       | 1        |    | 2        |       | 2        |       |          |
| 6            | 12 |                         |       |    | 4        |       | 2        |    | 3        |       | 3        |       |          |
| 7            | 14 |                         |       |    | 4        |       | 3        |    | 2        |       | 2        |       |          |
| 8            | 13 |                         |       |    | 4        |       | 2        |    | 3        |       | 2        |       |          |
| 9            | 14 |                         |       |    | 4        |       | 3        |    | 2        |       | 2        |       |          |
| 10           | 15 |                         |       |    | 4        |       | 3        |    | 2        |       | 2        |       |          |
| 11           | 16 |                         |       |    | 3        |       | 3        |    | 1        |       | 2        |       |          |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1863.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.  
Height of the Cistern of the Standard Barometer above the Sea-level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | o                             | o                                             | o    | o     |
| 1     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 2     | .29.994                                         | 30.082                                    | 29.935  | 0.147   | 69.7                          | 81.2                                          | 60.0 | 21.2  |
| 3     | .900                                            | 29.987                                    | .826    | .161    | 71.0                          | 81.4                                          | 62.8 | 18.6  |
| 4     | .867                                            | .944                                      | .812    | .132    | 71.1                          | 81.4                                          | 62.6 | 18.8  |
| 5     | .887                                            | .962                                      | .836    | .126    | 71.2                          | 81.0                                          | 62.8 | 18.2  |
| 6     | .916                                            | .984                                      | .855    | .129    | 72.4                          | 81.8                                          | 63.8 | 18.0  |
| 7     | .964                                            | 30.069                                    | .907    | .162    | 73.4                          | 81.8                                          | 66.4 | 15.4  |
| 8     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 9     | .920                                            | .001                                      | .877    | .124    | 69.8                          | 79.6                                          | 60.8 | 18.8  |
| 10    | .909                                            | 29.981                                    | .851    | .130    | 70.1                          | 80.2                                          | 60.0 | 20.2  |
| 11    | .965                                            | 30.026                                    | .882    | .144    | 63.7                          | 69.8                                          | 61.2 | 8.6   |
| 12    | .980                                            | .047                                      | .923    | .124    | 68.0                          | 75.2                                          | 62.4 | 12.8  |
| 13    | .961                                            | .050                                      | .895    | .155    | 68.8                          | 77.5                                          | 60.0 | 17.5  |
| 14    | .902                                            | 29.964                                    | .850    | .114    | 67.5                          | 72.8                                          | 63.2 | 9.6   |
| 15    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 16    | .872                                            | .944                                      | .822    | .122    | 72.4                          | 78.6                                          | 68.4 | 10.2  |
| 17    | .919                                            | .991                                      | .867    | .124    | 72.2                          | 81.2                                          | 65.9 | 15.3  |
| 18    | .971                                            | 30.044                                    | .924    | .120    | 72.9                          | 82.8                                          | 63.8 | 19.0  |
| 19    | .994                                            | .078                                      | .935    | .138    | 73.5                          | 83.8                                          | 64.0 | 19.8  |
| 20    | 30.009                                          | .093                                      | .955    | .138    | 74.3                          | 83.9                                          | 66.2 | 17.7  |
| 21    | 29.988                                          | .070                                      | .927    | .143    | 73.9                          | 82.6                                          | 67.0 | 15.6  |
| 22    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 23    | .964                                            | .051                                      | .899    | .152    | 70.1                          | 82.4                                          | 59.4 | 23.0  |
| 24    | .985                                            | .097                                      | .928    | .169    | 71.7                          | 83.0                                          | 61.6 | 21.4  |
| 25    | .961                                            | .086                                      | .898    | .138    | 72.1                          | 84.6                                          | 61.1 | 23.5  |
| 26    | .924                                            | 29.995                                    | .861    | .134    | 74.6                          | 85.6                                          | 65.2 | 20.4  |
| 27    | .918                                            | .989                                      | .829    | .160    | 75.4                          | 86.8                                          | 65.8 | 21.0  |
| 28    | .903                                            | .995                                      | .841    | .154    | 77.3                          | 87.8                                          | 67.0 | 20.8  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly Observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1863.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humi-<br>dity, complete satura-<br>tion being unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------|
|       | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                     |
| 1     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 2     | 63.0                            | 6.7                 | 57.6                | 12.1                         | .0483                            | 5.31                                             | 2.62                                                                    | 0.67                                                                |
| 3     | 65.4                            | 5.6                 | 60.9                | 10.1                         | .539                             | .92                                              | .83                                                                     | .72                                                                 |
| 4     | 63.0                            | 8.1                 | 56.5                | 14.6                         | .465                             | .10                                              | 3.18                                                                    | .62                                                                 |
| 5     | 62.8                            | 8.4                 | 56.1                | 15.1                         | .459                             | .04                                              | .26                                                                     | .61                                                                 |
| 6     | 63.9                            | 8.5                 | 57.1                | 15.3                         | .475                             | .20                                              | .40                                                                     | .61                                                                 |
| 7     | 66.6                            | 6.8                 | 61.2                | 12.2                         | .544                             | .95                                              | 2.92                                                                    | .67                                                                 |
| 8     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 9     | 61.0                            | 8.8                 | 54.0                | 15.8                         | .428                             | 4.70                                             | 3.25                                                                    | .59                                                                 |
| 10    | 62.4                            | 7.7                 | 56.2                | 13.9                         | .461                             | 5.06                                             | 2.97                                                                    | .63                                                                 |
| 11    | 60.8                            | 2.9                 | 58.2                | 5.5                          | .493                             | .48                                              | 1.11                                                                    | .83                                                                 |
| 12    | 63.5                            | 4.5                 | 59.9                | 8.1                          | .521                             | .76                                              | .77                                                                     | .77                                                                 |
| 13    | 63.0                            | 5.8                 | 58.4                | 10.4                         | .496                             | .47                                              | 2.24                                                                    | .71                                                                 |
| 14    | 63.9                            | 3.6                 | 61.0                | 6.5                          | .541                             | .98                                              | 1.44                                                                    | .81                                                                 |
| 15    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 16    | 67.9                            | 4.5                 | 64.3                | 8.1                          | .603                             | 6.61                                             | .99                                                                     | .77                                                                 |
| 17    | 66.1                            | 6.1                 | 61.2                | 11.0                         | .544                             | 5.97                                             | 2.58                                                                    | .70                                                                 |
| 18    | 64.1                            | 8.8                 | 57.1                | 15.8                         | .475                             | .19                                              | 3.54                                                                    | .60                                                                 |
| 19    | 65.9                            | 7.6                 | 60.6                | 12.9                         | .534                             | .82                                              | .08                                                                     | .65                                                                 |
| 20    | 65.9                            | 8.4                 | 60.0                | 14.3                         | .523                             | .71                                              | .41                                                                     | .63                                                                 |
| 21    | 64.9                            | 9.0                 | 58.6                | 15.3                         | .499                             | .45                                              | .56                                                                     | .61                                                                 |
| 22    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 23    | 60.2                            | 9.9                 | 52.3                | 17.8                         | .404                             | 4.44                                             | .59                                                                     | .55                                                                 |
| 24    | 60.9                            | 10.8                | 52.3                | 19.4                         | .404                             | .43                                              | 4.00                                                                    | .53                                                                 |
| 25    | 62.3                            | 9.8                 | 54.5                | 17.6                         | .435                             | .76                                              | 3.77                                                                    | .56                                                                 |
| 26    | 64.9                            | 9.7                 | 58.1                | 16.5                         | .491                             | 5.34                                             | .86                                                                     | .58                                                                 |
| 27    | 66.2                            | 9.2                 | 59.8                | 15.6                         | .520                             | .64                                              | .79                                                                     | .60                                                                 |
| 28    | 67.6                            | 9.7                 | 60.8                | 16.5                         | .537                             | .82                                              | 4.16                                                                    | .58                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January 1863, the Greenwich New Factors have been used for  
computing Dew-point.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1863.*

\* Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fah. | Range of the Barometer<br>for each hour during<br>the month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Temperature<br>for each hour during<br>the month. |      |       |
|----------------|------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|----------------------------------------------------------------|------|-------|
|                |                                                | Max.                                                         | Min.    | Diff.   |                               | Max.                                                           | Min. | Diff. |
|                | Inches.                                        | Inches.                                                      | Inches. | Inches. | o                             | o                                                              | o    | o     |
| Mid-<br>night. | 29.944                                         | 30.010                                                       | 29.863  | 0.147   | 67.5                          | 71.8                                                           | 62.4 | 9.4   |
| 1              | .933                                           | .001                                                         | .853    | .148    | 66.7                          | 70.8                                                           | 62.8 | 8.0   |
| 2              | .923                                           | 29.992                                                       | .841    | .151    | 66.1                          | 69.8                                                           | 61.2 | 8.6   |
| 3              | .914                                           | .981                                                         | .835    | .146    | 65.2                          | 69.4                                                           | 60.8 | 8.6   |
| 4              | .907                                           | .974                                                         | .822    | .152    | 64.5                          | 69.2                                                           | 60.2 | 9.0   |
| 5              | .929                                           | 30.007                                                       | .846    | .161    | 63.8                          | 67.6                                                           | 60.0 | 7.6   |
| 6              | .941                                           | .044                                                         | .856    | .188    | 63.7                          | 68.8                                                           | 59.4 | 9.4   |
| 7              | .961                                           | .052                                                         | .874    | .178    | 63.6                          | 68.4                                                           | 59.6 | 8.8   |
| 8              | .984                                           | .060                                                         | .908    | .152    | 66.5                          | 71.4                                                           | 61.2 | 10.2  |
| 9              | 30.008                                         | .091                                                         | .935    | .156    | 69.6                          | 74.3                                                           | 61.3 | 13.0  |
| 10             | .019                                           | .097                                                         | .943    | .154    | 72.9                          | 77.8                                                           | 62.4 | 15.4  |
| 11             | .007                                           | .081                                                         | .937    | .144    | 75.6                          | 81.6                                                           | 61.9 | 19.7  |
| Noon.          | 29.984                                         | .060                                                         | .917    | .143    | 77.9                          | 84.0                                                           | 62.6 | 21.4  |
| 1              | .953                                           | .037                                                         | .882    | .155    | 79.4                          | 85.8                                                           | 63.8 | 22.0  |
| 2              | .920                                           | .007                                                         | .844    | .163    | 80.4                          | 86.8                                                           | 64.2 | 22.6  |
| 3              | .898                                           | 29.986                                                       | .823    | .163    | 80.7                          | 87.8                                                           | 63.2 | 24.6  |
| 4              | .888                                           | .977                                                         | .812    | .165    | 80.3                          | 86.4                                                           | 63.2 | 23.2  |
| 5              | .888                                           | .962                                                         | .824    | .138    | 79.4                          | 84.9                                                           | 70.6 | 14.3  |
| 6              | .894                                           | .965                                                         | .813    | .152    | 75.8                          | 82.6                                                           | 63.6 | 19.0  |
| 7              | .910                                           | .991                                                         | .837    | .154    | 73.4                          | 79.8                                                           | 63.0 | 16.8  |
| 8              | .927                                           | 30.011                                                       | .851    | .160    | 72.0                          | 79.2                                                           | 63.0 | 16.2  |
| 9              | .941                                           | .028                                                         | .858    | .170    | 70.8                          | 78.6                                                           | 63.4 | 15.2  |
| 10             | .946                                           | .020                                                         | .850    | .170    | 69.7                          | 78.0                                                           | 62.8 | 15.2  |
| 11             | .944                                           | .021                                                         | .855    | .166    | 68.9                          | 77.6                                                           | 62.0 | 15.6  |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the Observations made at the several hours during the month.

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taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb<br>Thermometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Va-<br>pour in a cubic foot<br>of air. | Additional Weight of<br>Vapour required for<br>complete saturation. | Mean degree of Hu-<br>midity, complete satu-<br>ration being unity. |
|----------------|-------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
|                | °                             | °                   | °                   | °                            | Inches.                          | Troy grs.                                             | Troy grs.                                                           |                                                                     |
| Mid-<br>night. | 63.1                          | 4.4                 | 59.6                | 7.9                          | 0.516                            | 5.71                                                  | 1.71                                                                | 0.77                                                                |
| 1              | 62.7                          | 4.0                 | 59.5                | 7.2                          | .515                             | .70                                                   | .53                                                                 | .79                                                                 |
| 2              | 62.4                          | 3.7                 | 59.4                | 6.7                          | .513                             | .68                                                   | .42                                                                 | .80                                                                 |
| 3              | 61.7                          | 3.5                 | 58.9                | 6.3                          | .504                             | .60                                                   | .31                                                                 | .81                                                                 |
| 4              | 61.0                          | 3.5                 | 58.2                | 6.3                          | .493                             | .48                                                   | .28                                                                 | .81                                                                 |
| 5              | 60.6                          | 3.2                 | 57.7                | 6.1                          | .485                             | .39                                                   | .22                                                                 | .82                                                                 |
| 6              | 60.6                          | 3.1                 | 57.8                | 5.9                          | .486                             | .41                                                   | .18                                                                 | .82                                                                 |
| 7              | 60.4                          | 3.2                 | 57.5                | 6.1                          | .481                             | .36                                                   | .21                                                                 | .82                                                                 |
| 8              | 61.8                          | 4.7                 | 58.0                | 8.5                          | .489                             | .41                                                   | .78                                                                 | .75                                                                 |
| 9              | 63.0                          | 6.6                 | 57.7                | 11.9                         | .485                             | .33                                                   | 2.57                                                                | .68                                                                 |
| 10             | 64.2                          | 8.7                 | 57.2                | 15.7                         | .476                             | .20                                                   | 3.53                                                                | .60                                                                 |
| 11             | 64.8                          | 10.8                | 57.2                | 18.4                         | .476                             | .18                                                   | 4.30                                                                | .55                                                                 |
| Noon.          | 65.2                          | 12.7                | 56.3                | 21.6                         | .462                             | .00                                                   | 5.16                                                                | .49                                                                 |
| 1              | 65.8                          | 13.6                | 56.3                | 23.1                         | .462                             | 4.99                                                  | .63                                                                 | .47                                                                 |
| 2              | 66.3                          | 14.1                | 56.4                | 24.0                         | .464                             | .99                                                   | .95                                                                 | .46                                                                 |
| 3              | 66.5                          | 14.2                | 56.6                | 24.1                         | .467                             | 5.03                                                  | 6.01                                                                | .46                                                                 |
| 4              | 66.1                          | 14.2                | 56.2                | 24.1                         | .461                             | 4.96                                                  | 5.95                                                                | .46                                                                 |
| 5              | 66.7                          | 12.7                | 57.8                | 21.6                         | .486                             | 5.24                                                  | .38                                                                 | .49                                                                 |
| 6              | 67.3                          | 8.5                 | 61.3                | 14.5                         | .546                             | .94                                                   | 3.60                                                                | .62                                                                 |
| 7              | 66.3                          | 7.1                 | 60.6                | 12.8                         | .534                             | .82                                                   | .05                                                                 | .66                                                                 |
| 8              | 65.7                          | 6.3                 | 60.7                | 11.3                         | .536                             | .87                                                   | 2.63                                                                | .69                                                                 |
| 9              | 64.9                          | 5.9                 | 60.2                | 10.6                         | .527                             | .78                                                   | .42                                                                 | .71                                                                 |
| 10             | 64.4                          | 5.3                 | 60.2                | 9.5                          | .527                             | .79                                                   | .14                                                                 | .73                                                                 |
| 11             | 63.8                          | 5.1                 | 59.7                | 9.2                          | .518                             | .72                                                   | .02                                                                 | .74                                                                 |

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taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1863.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                               |
|-------|-----------------------|---------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------|
|       | °                     | Inches                          |                                   |                                                                                                                          |
| 1     | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                          |
| 2     | 135.0                 | ...                             | Variable.                         | Cloudless; also foggy between 8 & 9 P. M.                                                                                |
| 3     | 135.0                 | ...                             | S. W. & W.                        | Cloudless.                                                                                                               |
| 4     | 137.0                 | ...                             | W. & S. W.                        | Cloudless; also foggy after 9 P. M.                                                                                      |
| 5     | 140.2                 | ...                             | N. W. & S. W.                     | Cloudless.                                                                                                               |
| 6     | 137.0                 | ...                             | S. W. & S.                        | Cloudless till 7 P. M. Scatd. clouds afterwards; also drizzled between 8 and 9 P. M.                                     |
| 7     | 135.0                 | ...                             | S. W. & S.                        | Scatd. $\searrow$ till 2 P. M. cloudless afterwards; also drizzling between 8 & 9 P. M.                                  |
| 8     | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                          |
| 9     | 138.5                 | ...                             | N. W. & W. & N.                   | Cloudless.                                                                                                               |
| 10    | 133.0                 | ...                             | E. & N. W.                        | Cloudless till 2 P. M. cloudy afterwards; also drizzling at 8 & 10 P. M.                                                 |
| 11    | ...                   | 0.96                            | E. & N.                           | Cloudy: also incessantly drizzling the whole day.                                                                        |
| 12    | 134.5                 | ...                             | N. & N. E. & W.                   | Cloudy till 7 A. M. Scatd. $\nearrow$ till 4 P. M. cloudless afterwards; also foggy at Midnight                          |
| 13    | 133.0                 | ...                             | N. & N. W.                        | Cloudless till 10 A. M. Scatd. $\searrow$ & $\nearrow$ till 3 P. M. cloudless afterwards; also slightly foggy at 9 P. M. |
| 14    | ...                   | ...                             | E. & S. & S. E.                   | Cloudless till 4 A. M. cloudy till 6 P. M. cloudless afterwards.                                                         |
| 15    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                          |
| 16    | 129.0                 | 0.24                            | N. E. & S.                        | Cloudy till 11 A. M. Scatd. $\searrow$ till 6 P. M. cloudy afterwards; also raining at 4 A. M. & between 6 & 7 A. M.     |
| 17    | 134.0                 | ...                             | N. & E.                           | Scatd. clouds till 1 P. M. cloudless afterwards; also foggy between 4 & 7 A. M.                                          |
| 18    | 136.9                 | ...                             | E. & S. E.                        | Cloudless.                                                                                                               |
| 19    | 136.5                 | ...                             | S. & S. E. & E.                   | Cloudless.                                                                                                               |
| 20    | 134.4                 | ...                             | N. & E.                           | Cloudless.                                                                                                               |
| 21    | 134.0                 | ...                             | N.                                | Cloudless.                                                                                                               |
| 22    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                          |
| 23    | 130.0                 | ...                             | W.                                | Cloudless.                                                                                                               |
| 24    | 134.8                 | ...                             | W. & S.                           | Cloudless.                                                                                                               |
| 25    | 140.0                 | ...                             | N. W. & W. & S. W.                | Cloudless.                                                                                                               |
| 26    | 137.8                 | ...                             | W. & S.                           | Cloudless.                                                                                                               |
| 27    | 140.0                 | ...                             | S. W. & W.                        | Cloudless.                                                                                                               |
| 28    | 132.0                 | ...                             | W. & S.                           | Cloudless.                                                                                                               |

$\searrow$  Cirri,  $\searrow$  i Cirro strati,  $\nearrow$  i Cumuli,  $\nearrow$  i Cumulo strati,  $\searrow$  i Nimbi, — i Strati,  $\searrow$  i Cirro cumuli.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1863.*

MONTHLY RESULTS.

|                                                                   | Inches |
|-------------------------------------------------------------------|--------|
| Mean height of the Barometer for the month, .. ..                 | 29.940 |
| Max. height of the Barometer occurred at 10 A. M. on the 24th, .. | 30.097 |
| Min. height of the Barometer occurred at 4 P. M. on the 4th, ..   | 29.812 |
| <i>Extreme range</i> of the Barometer during the month, ..        | 0.285  |
| Mean of the Daily Max. Pressures, .. ..                           | 30.020 |
| Ditto ditto Min. ditto, .. ..                                     | 29.881 |
| <i>Mean daily range</i> of the Barometer during the month, ..     | 0.189  |

|                                                                    | °    |
|--------------------------------------------------------------------|------|
| Mean Dry Bulb Thermometer for the month, .. ..                     | 71.6 |
| Max. Temperature occurred at 3 P. M. on the 28th, .. ..            | 87.8 |
| Min. Temperature occurred at 6 A. M. on the 23rd, .. ..            | 59.4 |
| <i>Extreme range</i> of the Temperature during the month, .. ..    | 28.4 |
| Mean of the daily Max. Temperature, .. ..                          | 81.1 |
| Ditto ditto Min. ditto, .. ..                                      | 63.4 |
| <i>Mean daily range</i> of the Temperature during the month, .. .. | 17.7 |
| Mean Wet Bulb Thermometer for the month, .. ..                     | 64.0 |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..      | 7.6  |
| Computed Mean Dew-point for the month, .. ..                       | 57.9 |
| Mean Dry Bulb Thermometer above computed Mean Dew-point, ..        | 13.7 |

|                                                | Inches |
|------------------------------------------------|--------|
| Mean Elastic force of Vapour for the month, .. | 0.488  |

|                                                                         | Troy grains |
|-------------------------------------------------------------------------|-------------|
| Mean Weight of Vapour for the month, .. ..                              | 5.34        |
| Additional Weight of Vapour required for complete saturation, ..        | 3.06        |
| Mean degree of humidity for the month, complete saturation being unity, | 0.64        |

|                                                      | Inches       |
|------------------------------------------------------|--------------|
| Rained 5 days, Max. fall of rain during 24 hours, .. | 0.96         |
| Total amount of rain during the month, ..            | 1.20         |
| Prevailing direction of the Wind, .. ..              | W. & N. & E. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1863.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on. | N. E. | Rain on. | E. | Rain on. | S. E. | Rain on. | S. | Rain on. | S. W. | Rain on. | W. | Rain on. | N. W. | Rain on. | Calm. | Rain on. | Missed. |
|-----------|--------------|----------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|-------|----------|---------|
|           | No. of days. |          |       |          |    |          |       |          |    |          |       |          |    |          |       |          |       |          |         |
| Midnight. | 4            |          |       |          | 5  | 1        |       |          | 4  | 1        | 6     | 2        |    |          | 2     |          |       |          | 2       |
| 1         | 4            |          |       |          | 4  | 1        |       |          | 4  | 4        | 4     | 6        | 2  |          | 2     |          |       |          | 1       |
| 2         | 4            |          |       |          | 4  | 1        |       |          | 4  | 4        | 4     | 5        | 2  |          | 2     |          |       |          |         |
| 3         | 4            |          |       |          | 4  | 1        |       |          | 4  | 4        | 4     | 5        | 3  |          | 3     |          |       |          | 4       |
| 4         | 3            |          |       |          | 4  | 1        |       |          | 4  | 1        | 2     | 4        | 3  |          | 3     |          |       |          | 4       |
| 5         | 5            |          |       |          | 2  |          |       |          | 2  |          | 3     | 6        | 3  |          | 3     |          |       |          |         |
| 6         | 5            |          | 2     | 1        | 3  |          | 1     |          | 2  |          | 3     | 5        | 3  |          | 3     |          |       |          |         |
| 7         | 6            |          | 2     |          | 2  |          | 1     | 1        | 3  |          | 3     | 3        | 3  |          | 3     |          |       |          |         |
| 8         | 2            |          | 4     |          | 3  | 1        |       |          | 2  |          | 1     | 6        | 6  |          | 4     |          |       |          | 3       |
| 9         | 3            |          | 3     |          | 5  | 1        | 1     |          | 1  |          | 3     | 6        | 6  |          | 2     |          |       |          |         |
| 10        | 4            |          | 5     |          | 2  |          | 3     |          | 1  |          |       | 4        | 4  |          | 5     |          |       |          |         |
| 11        | 2            |          | 4     |          | 4  | 1        | 2     |          | 1  |          | 1     | 6        |    |          | 4     |          |       |          |         |
| Noon.     | 2            |          | 4     |          | 3  | 1        | 2     |          | 1  |          | 1     | 6        |    |          | 4     |          | 1     |          |         |
| 1         | 4            |          | 1     |          | 4  | 1        | 1     |          | 2  |          | 2     | 3        | 7  |          | 3     |          |       |          |         |
| 2         | 4            |          | 3     |          | 3  | 1        | 2     |          | 1  |          | 4     | 4        | 3  |          | 4     |          |       |          |         |
| 3         | 3            |          | 1     |          | 2  | 1        | 3     |          | 2  |          | 3     | 6        | 5  |          | 4     |          |       |          |         |
| 4         | 3            |          | 1     |          | 4  | 1        | 3     |          |    |          | 2     | 5        | 5  |          | 5     |          |       |          | 1       |
| 5         | 2            |          | 2     |          | 5  |          | 1     |          | 1  |          | 5     | 5        | 5  |          | 2     |          |       |          |         |
| 6         | 4            |          | 1     |          | 4  |          |       |          | 1  |          | 5     | 5        | 5  |          | 2     |          |       |          |         |
| 7         | 4            | 1        | 1     |          | 3  |          | 2     |          | 3  |          | 5     | 5        | 4  |          | 2     |          |       |          |         |
| 8         | 4            | 1        | 1     |          | 3  | 1        | 2     |          | 3  |          | 3     | 4        | 4  |          | 1     |          |       |          |         |
| 9         | 4            |          | 1     |          | 3  |          | 2     |          | 3  | 1        | 6     | 4        | 4  |          | 1     |          |       |          |         |
| 10        | 4            |          | 1     |          | 3  | 1        | 2     |          | 4  |          | 5     | 4        | 4  |          | 1     |          |       |          |         |
| 11        | 4            |          | 1     |          | 3  |          | 2     |          | 4  |          | 5     |          | 4  |          | 1     |          |       |          | 1       |



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1863.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.

Height of the Cistern of the Standard Barometer above the Sea-level, 18.11.

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | o                             | o                                             | o    | o     |
| 1     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 2     | 29.800                                          | 29.885                                    | 29.726  | 0.159   | 79.7                          | 89.6                                          | 71.6 | 18.0  |
| 3     | .762                                            | .832                                      | .700    | .132    | 80.9                          | 91.1                                          | 73.8 | 17.3  |
| 4     | .795                                            | .876                                      | .746    | .130    | 81.3                          | 91.3                                          | 74.8 | 16.5  |
| 5     | .844                                            | .923                                      | .791    | .132    | 81.4                          | 91.4                                          | 75.8 | 15.6  |
| 6     | .832                                            | .909                                      | .774    | .135    | 81.6                          | 91.6                                          | 75.0 | 16.6  |
| 7     | .831                                            | .903                                      | .782    | .121    | 81.0                          | 91.8                                          | 74.8 | 17.0  |
| 8     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 9     | .876                                            | .947                                      | .823    | .124    | 80.8                          | 91.8                                          | 72.0 | 19.8  |
| 10    | .866                                            | .954                                      | .794    | .160    | 81.4                          | 91.8                                          | 74.0 | 17.8  |
| 11    | .793                                            | .882                                      | .722    | .160    | 81.5                          | 91.3                                          | 73.8 | 17.5  |
| 12    | .754                                            | .831                                      | .702    | .129    | 81.6                          | 91.0                                          | 71.8 | 22.2  |
| 13    | .739                                            | .811                                      | .683    | .128    | 81.7                          | 93.0                                          | 75.0 | 18.0  |
| 14    | .814                                            | .889                                      | .751    | .138    | 81.9                          | 90.6                                          | 76.2 | 14.4  |
| 15    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 16    | .872                                            | .955                                      | .818    | .137    | 80.7                          | 87.2                                          | 75.8 | 11.4  |
| 17    | .823                                            | .898                                      | .759    | .139    | 80.7                          | 92.4                                          | 72.8 | 19.6  |
| 18    | .865                                            | .937                                      | .809    | .128    | 79.3                          | 87.6                                          | 71.2 | 16.4  |
| 19    | .917                                            | 30.017                                    | .847    | .170    | 81.9                          | 92.2                                          | 73.4 | 18.8  |
| 20    | .896                                            | 29.976                                    | .828    | .148    | 83.0                          | 93.4                                          | 74.2 | 19.2  |
| 21    | .896                                            | .975                                      | .837    | .138    | 83.5                          | 93.4                                          | 74.0 | 19.4  |
| 22    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 23    | .863                                            | .948                                      | .801    | .147    | 86.8                          | 96.0                                          | 77.8 | 18.2  |
| 24    | .846                                            | .930                                      | .791    | .139    | 86.3                          | 97.8                                          | 76.8 | 21.0  |
| 25    | .839                                            | .906                                      | .788    | .118    | 87.6                          | 98.4                                          | 77.0 | 21.4  |
| 26    | .845                                            | .921                                      | .775    | .146    | 85.6                          | 96.4                                          | 75.4 | 21.0  |
| 27    | .803                                            | .887                                      | .731    | .156    | 85.7                          | 96.9                                          | 76.4 | 20.5  |
| 28    | .769                                            | .854                                      | .696    | .158    | 85.8                          | 97.6                                          | 75.6 | 22.0  |
| 29    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 30    | .771                                            | .848                                      | .697    | .151    | 86.4                          | 98.0                                          | 80.0 | 18.0  |
| 31    | .761                                            | .848                                      | .676    | .172    | 87.0                          | 99.0                                          | 79.8 | 19.2  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly Observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1863.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Date. | Mean Wet Bulb Thermometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew Point. | Mean Elastic force of Vapour. | Mean Weight of Vapour in a Cubic foot of air. | Additional Weight of Vapour required for complete saturation. | Mean degree of Humidity, complete saturation being unity. |
|-------|----------------------------|---------------------|---------------------|---------------------------|-------------------------------|-----------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------|
|       | °                          | °                   | °                   | °                         | Inches.                       | T. gr.                                        | T. gr.                                                        |                                                           |
| 1     | Sunday.                    |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 2     | 71.4                       | 8.3                 | 65.6                | 14.1                      | .0630                         | 6.80                                          | 3.92                                                          | .63                                                       |
| 3     | 73.9                       | 7.0                 | 69.0                | 11.9                      | .704                          | 7.57                                          | .53                                                           | .68                                                       |
| 4     | 74.7                       | 6.6                 | 70.1                | 11.2                      | .729                          | .85                                           | .39                                                           | .70                                                       |
| 5     | 74.2                       | 7.2                 | 69.2                | 12.2                      | .708                          | .62                                           | .65                                                           | .68                                                       |
| 6     | 74.4                       | 7.2                 | 69.4                | 12.2                      | .713                          | .67                                           | .67                                                           | .68                                                       |
| 7     | 71.2                       | 9.8                 | 64.3                | 16.7                      | .603                          | 6.49                                          | 4.65                                                          | .58                                                       |
| 8     | Sunday.                    |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 9     | 73.5                       | 7.3                 | 68.4                | 12.4                      | .690                          | 7.44                                          | 3.63                                                          | .67                                                       |
| 10    | 74.6                       | 6.8                 | 69.8                | 11.8                      | .722                          | .76                                           | .51                                                           | .69                                                       |
| 11    | 75.6                       | 5.9                 | 71.5                | 10.0                      | .763                          | 8.21                                          | .10                                                           | .73                                                       |
| 12    | 70.8                       | 10.8                | 63.2                | 18.4                      | .582                          | 6.26                                          | 5.08                                                          | .55                                                       |
| 13    | 75.6                       | 6.1                 | 71.3                | 10.4                      | .758                          | 8.16                                          | 3.21                                                          | .72                                                       |
| 14    | 73.4                       | 8.5                 | 67.4                | 14.5                      | .668                          | 7.17                                          | 4.27                                                          | .63                                                       |
| 15    | Sunday.                    |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 16    | 73.2                       | 7.5                 | 67.9                | 12.8                      | .679                          | .31                                           | 3.73                                                          | .66                                                       |
| 17    | 71.2                       | 9.5                 | 64.5                | 16.2                      | .607                          | 6.54                                          | 4.50                                                          | .59                                                       |
| 18    | 68.9                       | 10.4                | 61.6                | 17.7                      | .552                          | 5.95                                          | .64                                                           | .56                                                       |
| 19    | 69.7                       | 12.2                | 61.2                | 20.7                      | .544                          | .84                                           | 5.60                                                          | .51                                                       |
| 20    | 74.0                       | 9.0                 | 67.7                | 15.3                      | .674                          | 7.24                                          | 4.58                                                          | .61                                                       |
| 21    | 69.7                       | 13.8                | 60.0                | 23.5                      | .523                          | 5.59                                          | 6.41                                                          | .47                                                       |
| 22    | Sunday.                    |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 23    | 72.1                       | 14.7                | 63.3                | 23.5                      | .584                          | 6.20                                          | 7.01                                                          | .47                                                       |
| 24    | 72.8                       | 13.5                | 63.3                | 23.0                      | .584                          | .21                                           | 6.81                                                          | .48                                                       |
| 25    | 72.1                       | 15.5                | 62.8                | 24.8                      | .574                          | .10                                           | 7.42                                                          | .45                                                       |
| 26    | 70.2                       | 15.4                | 59.4                | 26.2                      | .513                          | 5.47                                          | .29                                                           | .43                                                       |
| 27    | 72.5                       | 13.1                | 63.4                | 22.3                      | .586                          | 6.24                                          | 6.56                                                          | .49                                                       |
| 28    | 72.5                       | 13.3                | 63.2                | 22.6                      | .582                          | .19                                           | .64                                                           | .48                                                       |
| 29    | Sunday.                    |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 30    | 79.7                       | 6.7                 | 75.0                | 11.4                      | .854                          | 9.11                                          | 3.95                                                          | .70                                                       |
| 31    | 79.5                       | 7.5                 | 75.0                | 12.0                      | .854                          | .09                                           | 4.20                                                          | .68                                                       |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January 1863, the Greenwich New Factors have been used  
for computing Dew-point.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer for<br>each hour during the<br>month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture for each hour<br>during the<br>month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|---------------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                                | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                                   | o    | o     |
| Mid-<br>night. | 29.833                                          | 29.906                                                       | 29.781  | 0.175   | 78.1                          | 81.8                                                                | 75.0 | 6.8   |
| 1              | .823                                            | .897                                                         | .718    | .179    | 77.4                          | 81.4                                                                | 73.6 | 7.8   |
| 2              | .813                                            | .888                                                         | .716    | .172    | 76.7                          | 81.0                                                                | 73.4 | 7.6   |
| 3              | .800                                            | .881                                                         | .703    | .178    | 76.3                          | 80.8                                                                | 73.2 | 7.6   |
| 4              | .797                                            | .877                                                         | .705    | .172    | 76.0                          | 80.4                                                                | 72.4 | 8.0   |
| 5              | .805                                            | .891                                                         | .716    | .175    | 75.4                          | 80.0                                                                | 71.2 | 8.8   |
| 6              | .832                                            | .918                                                         | .732    | .186    | 75.1                          | 80.0                                                                | 71.2 | 8.8   |
| 7              | .851                                            | .957                                                         | .746    | .211    | 75.4                          | 80.2                                                                | 71.6 | 8.6   |
| 8              | .882                                            | .992                                                         | .787    | .205    | 78.5                          | 82.8                                                                | 75.2 | 7.6   |
| 9              | .898                                            | 30.004                                                       | .797    | .207    | 81.5                          | 87.8                                                                | 75.8 | 12.0  |
| 10             | .903                                            | .014                                                         | .811    | .203    | 84.6                          | 90.2                                                                | 80.6 | 9.6   |
| 11             | .892                                            | .017                                                         | .798    | .219    | 87.4                          | 92.2                                                                | 83.8 | 8.4   |
| Noon.          | .867                                            | 29.992                                                       | .772    | .220    | 89.8                          | 95.0                                                                | 85.0 | 10.0  |
| 1              | .836                                            | .953                                                         | .742    | .211    | 91.5                          | 97.0                                                                | 86.2 | 10.8  |
| 2              | .807                                            | .925                                                         | .701    | .224    | 92.7                          | 98.6                                                                | 87.2 | 11.4  |
| 3              | .783                                            | .885                                                         | .687    | .198    | 93.1                          | 99.0                                                                | 86.6 | 12.4  |
| 4              | .771                                            | .874                                                         | .681    | .193    | 92.7                          | 98.8                                                                | 85.5 | 13.3  |
| 5              | .771                                            | .858                                                         | .688    | .170    | 89.9                          | 96.4                                                                | 83.8 | 12.6  |
| 6              | .772                                            | .853                                                         | .676    | .177    | 87.1                          | 94.2                                                                | 81.9 | 12.3  |
| 7              | .785                                            | .859                                                         | .698    | .161    | 84.5                          | 89.4                                                                | 80.8 | 8.6   |
| 8              | .806                                            | .881                                                         | .724    | .157    | 82.5                          | 86.8                                                                | 78.6 | 8.2   |
| 9              | .823                                            | .898                                                         | .754    | .144    | 81.0                          | 86.8                                                                | 77.6 | 9.2   |
| 10             | .830                                            | .913                                                         | .748    | .165    | 79.9                          | 86.6                                                                | 76.4 | 10.2  |
| 11             | .831                                            | .915                                                         | .740    | .175    | 78.9                          | 84.0                                                                | 75.0 | 9.0   |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the Observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Hour.      | Mean Wet Bulb Thermometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew Point. | Mean Elastic force of Vapour. | Mean Weight of Vapour in a Cubic foot of air. | Additional Weight of Vapour required for complete saturation. | Mean degree of Humidity, complete saturation being |
|------------|----------------------------|---------------------|---------------------|---------------------------|-------------------------------|-----------------------------------------------|---------------------------------------------------------------|----------------------------------------------------|
|            | o                          | o                   | o                   | o                         | Inches.                       | Troy grs.                                     | Troy grs.                                                     |                                                    |
| Mid-night. | 72.7                       | 5.4                 | 68.9                | 9.2                       | 0.701                         | 7.60                                          | 2.62                                                          | 0.74                                               |
| 1          | 72.4                       | 5.0                 | 68.9                | 8.5                       | .701                          | .60                                           | .41                                                           | .76                                                |
| 2          | 71.8                       | 4.9                 | 68.4                | 8.3                       | .690                          | .50                                           | .30                                                           | .77                                                |
| 3          | 72.0                       | 4.3                 | 69.0                | 7.3                       | .704                          | .65                                           | .04                                                           | .79                                                |
| 4          | 71.8                       | 4.2                 | 68.9                | 7.1                       | .701                          | .63                                           | 1.97                                                          | .80                                                |
| 5          | 71.7                       | 3.7                 | 69.1                | 6.3                       | .706                          | .69                                           | .74                                                           | .82                                                |
| 6          | 71.0                       | 4.1                 | 68.1                | 7.0                       | .684                          | .44                                           | .90                                                           | .80                                                |
| 7          | 71.1                       | 4.3                 | 68.1                | 7.3                       | .684                          | .44                                           | .99                                                           | .79                                                |
| 8          | 72.0                       | 6.5                 | 67.4                | 11.1                      | .668                          | .23                                           | 3.12                                                          | .70                                                |
| 9          | 72.4                       | 9.1                 | 66.0                | 15.5                      | .638                          | 6.85                                          | 4.46                                                          | .61                                                |
| 10         | 73.2                       | 11.4                | 65.2                | 19.4                      | .621                          | .65                                           | 5.74                                                          | .54                                                |
| 11         | 73.4                       | 14.0                | 65.0                | 22.4                      | .617                          | .57                                           | 6.88                                                          | .49                                                |
| Noon.      | 74.1                       | 15.7                | 64.7                | 25.1                      | .611                          | .47                                           | 7.95                                                          | .45                                                |
| 1          | 74.3                       | 17.2                | 64.0                | 27.5                      | .597                          | .28                                           | 8.87                                                          | .42                                                |
| 2          | 74.7                       | 18.0                | 63.9                | 28.8                      | .595                          | .25                                           | 9.43                                                          | .40                                                |
| 3          | 74.3                       | 18.8                | 63.0                | 30.1                      | .578                          | .08                                           | .78                                                           | .38                                                |
| 4          | 74.7                       | 18.0                | 63.9                | 28.8                      | .595                          | .25                                           | .43                                                           | .40                                                |
| 5          | 74.6                       | 15.3                | 65.4                | 24.5                      | .626                          | .61                                           | 7.85                                                          | .46                                                |
| 6          | 74.9                       | 12.2                | 67.6                | 19.5                      | .672                          | 7.14                                          | 6.19                                                          | .54                                                |
| 7          | 74.2                       | 10.3                | 67.0                | 17.5                      | .659                          | .04                                           | 5.31                                                          | .57                                                |
| 8          | 73.8                       | 8.7                 | 67.7                | 14.8                      | .674                          | .24                                           | 4.40                                                          | .62                                                |
| 9          | 73.5                       | 7.5                 | 68.2                | 12.8                      | .686                          | .38                                           | 3.76                                                          | .66                                                |
| 10         | 73.1                       | 6.8                 | 68.3                | 11.6                      | .688                          | .42                                           | .36                                                           | .69                                                |
| 11         | 73.0                       | 5.9                 | 68.9                | 10.0                      | .701                          | .59                                           | 2.88                                                          | .73                                                |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January 1863, the Greenwich New Factors have been used  
for computing Dew-point.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1863.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar<br>radiation. | Rain Gauge<br>5 feet above<br>Ground. | Prevailing direction<br>of the Wind. | General Aspect of the Sky.                                                                                     |
|-------|--------------------------|---------------------------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------|
|       | o                        | Inches                                |                                      |                                                                                                                |
| 1     | ...                      | ...                                   | Sunday.                              |                                                                                                                |
| 2     | 140.8                    | ...                                   | S. & S. W.                           | Cloudless.                                                                                                     |
| 3     | 138.5                    | ...                                   | S.                                   | Cloudless till 2 A. M. cloudy till 8 A. M.<br>cloudless afterwards.                                            |
| 4     | 139.0                    | ...                                   | S.                                   | Cloudless till 6 A. M. Scatd. clouds till<br>10 A. M. cloudless afterwards.                                    |
| 5     | 139.4                    | ...                                   | S.                                   | Cloudy till 8 A. M. cloudless afterwards.                                                                      |
| 6     | 137.0                    | ...                                   | S. & S. W.                           | Flying clouds till 7 A. M. cloudless<br>afterwards.                                                            |
| 7     | 142.5                    | ...                                   | S. & S. W.                           | Cloudless.                                                                                                     |
| 8     | ...                      | ...                                   | Sunday.                              |                                                                                                                |
| 9     | 140.0                    | ...                                   | S. W. & S.                           | Cloudless.                                                                                                     |
| 10    | 137.5                    | ...                                   | S.                                   | Cloudless till 4 A. M. cloudy till 9 A. M.<br>cloudless afterwards; also foggy be-<br>tween Midnight & 4 A. M. |
| 11    | 137.4                    | ...                                   | S.                                   | Flying clouds till 4 A. M. cloudless<br>afterwards; also foggy between 5<br>& 7 A. M.                          |
| 12    | 138.0                    | ...                                   | S.                                   | Cloudless.                                                                                                     |
| 13    | 140.0                    | ...                                   | S.                                   | Cloudless till 1 P. M. Scatd. ~i till 6<br>P. M. cloudless afterwards.                                         |
| 14    | 135.3                    | ...                                   | S. W. & S.                           | Cloudless.                                                                                                     |
| 15    | ...                      | ...                                   | Sunday.                              |                                                                                                                |
| 16    | ...                      | ...                                   | S. & W. & S. W.                      | Cloudy till 6 P. M. cloudless after-<br>wards.                                                                 |
| 17    | 137.5                    | ...                                   | S. & W. & N. W.                      | Cloudless till 4 A. M. cloudy till 9 A. M.<br>Scatd. ~i till 7 P. M. cloudless after-<br>wards.                |
| 18    | ...                      | ...                                   | N. W. & S. W.                        | Cloudless till 6 A. M. cloudy till 6 P. M.<br>Scatd. ~i afterwards.                                            |
| 19    | 133.0                    | ...                                   | S. & E. & N.                         | Cloudy till 9 A. M. Scatd. ~i till 4 P. M.<br>cloudless afterwards.                                            |
| 20    | 133.5                    | ...                                   | W. & S. W. & S.                      | Cloudless till 3 P. M. cloudy after-<br>wards.                                                                 |
| 21    | 135.3                    | ...                                   | S. & N.                              | Scatd. clouds till 3 A. M. Scatd. ~i till<br>5 P. M.; Scatd. ~i afterwards.                                    |
| 22    | ...                      | ...                                   | Sunday.                              |                                                                                                                |
| 23    | 137.8                    | ...                                   | S. W. & W.                           | Cloudy till 6 A. M. Scatd. ~i till Noon;<br>cloudless afterwards.                                              |
| 24    | 140.4                    | ...                                   | S. W. & W.                           | Cloudless.                                                                                                     |
| 25    | 137.0                    | ...                                   | N. W. & N. & S. W.                   | Cloudless.                                                                                                     |
| 26    | 136.0                    | ...                                   | N. & N. W.                           | Cloudless.                                                                                                     |
| 27    | 144.2                    | ...                                   | N. & S. W.                           | Cloudless.                                                                                                     |

~i Cirri, ~i Cirro strati, ~i Cumuli, ~i Cumulo strati, ~i Nimbi, —i Strati  
~i Cirro cumuli.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1863.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                              |
|-------|-----------------------|---------------------------------|-----------------------------------|-------------------------------------------------------------------------|
|       | °                     | Inches.                         |                                   |                                                                         |
| 28    | 138.0                 | ...                             | S. & N. & W.                      | Cloudless.                                                              |
| 29    | ...                   | ...                             | Sunday.                           |                                                                         |
| 30    | 139.5                 | ...                             | S.                                | Cloudy till 8 A. M. cloudless afterwards.                               |
| 31    | 140.0                 | ...                             | S.                                | Cloudless till 4 A. M. Scatd. clouds till 9 A. M. cloudless afterwards. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1863.*

MONTHLY RESULTS.

|                                                                |    |    | Inches |
|----------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month,                    | .. | .. | 29.326 |
| Max. height of the Barometer occurred at 11 A. M. on the 19th, | .. | .. | 30.017 |
| Min. height of the Barometer occurred at 6 P. M. on the 31st,  | .. | .. | 29.676 |
| <i>Extreme range</i> of the Barometer during the month,        | .. | .. | 0.341  |
| Mean of the daily Max. Pressures,                              | .. | .. | 29.905 |
| Ditto ditto Min. ditto,                                        | .. | .. | 29.763 |
| <i>Mean daily range</i> of the Barometer during the month,     | .. | .. | 0.142  |

|                                                              |    |    | °    |
|--------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                     | .. | .. | 82.9 |
| Max. Temperature occurred at 3 P. M. on the 31st,            | .. | .. | 99.0 |
| Min. Temperature occurred at 5 & 6 A. M. on the 18th,        | .. | .. | 71.2 |
| <i>Extreme range</i> of the Temperature during the month,    | .. | .. | 27.8 |
| Mean of the daily Max. Temperature,                          | .. | .. | 93.3 |
| Ditto ditto Min. ditto,                                      | .. | .. | 75.0 |
| <i>Mean daily range</i> of the Temperature during the month, | .. | .. | 18.3 |

|                                                               |    |    | °      |
|---------------------------------------------------------------|----|----|--------|
| Mean Wet Bulb Thermometer for the month,                      | .. | .. | 73.1   |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, .. |    |    | 9.8    |
| Computed Mean Dew-point for the month,                        | .. | .. | 66.2   |
| Mean Dry Bulb Thermometer above computed Mean Dew-point,      | .. | .. | 16.7   |
|                                                               |    |    | Inches |
| Mean Elastic force of Vapour for the month, ..                | .. | .. | 0.642  |

|                                                                         |    |    | Troy grains |
|-------------------------------------------------------------------------|----|----|-------------|
| Mean Weight of Vapour for the month,                                    | .. | .. | 6.88        |
| Additional Weight of Vapour required for complete saturation,           | .. | .. | 4.91        |
| Mean degree of humidity for the month, complete saturation being unity, |    |    | 0.58        |

|                                                               |    |    | Inches     |
|---------------------------------------------------------------|----|----|------------|
| Rained No. days, <del>Max</del> fall of rain during 24 hours, | .. | .. | Nil.       |
| Total amount of rain during the month,                        | .. | .. | Nil.       |
| Prevailing direction of the Wind,                             | .. | .. | S. & S. W. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1863.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.     | N. | Rain on. | N. E. | Rain on. | E.           | S. E. | Rain on. | S. | Rain on. | S. W. | Rain on. | W. | Rain on. | N. W. | Rain on. | Calm. | Rain on. |
|-----------|----|----------|-------|----------|--------------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|-------|----------|
|           |    |          |       |          |              |       |          |    |          |       |          |    |          |       |          |       |          |
|           |    |          |       |          | No. of days. |       |          |    |          |       |          |    |          |       |          |       |          |
| Midnight. | 2  |          |       |          |              |       |          | 16 |          | 4     |          | 1  |          |       |          |       | 3        |
| 1         | 2  |          |       |          |              |       |          | 18 |          | 4     |          | 1  |          |       |          |       | 1        |
| 2         | 2  |          |       |          |              |       |          | 17 |          | 4     |          | 1  |          |       |          |       | 2        |
| 3         | 1  |          |       |          |              |       |          | 20 |          | 3     |          |    |          |       |          |       | 2        |
| 4         | 1  |          |       |          |              |       |          | 18 |          | 5     |          |    |          |       |          |       | 2        |
| 5         |    |          |       |          |              |       |          | 17 |          | 4     |          | 1  |          |       |          |       | 4        |
| 6         | 2  |          |       |          |              |       |          | 15 |          | 7     |          | 1  |          | 1     |          |       |          |
| 7         |    |          |       |          |              |       |          | 14 |          | 8     |          | 1  |          | 1     |          |       |          |
| 8         | 2  |          |       |          |              |       |          | 10 |          | 7     |          | 4  |          | 2     |          |       |          |
| 9         | 3  |          |       |          |              |       |          | 10 |          | 7     |          | 3  |          | 3     |          |       |          |
| 10        | 4  |          |       |          |              |       |          | 10 |          | 5     |          | 5  |          | 2     |          |       |          |
| 11        | 3  |          |       |          |              |       |          | 8  |          | 7     |          | 4  |          | 4     |          |       |          |
|           |    |          |       |          |              |       |          |    |          |       |          |    |          |       |          |       |          |
| Noon.     | 7  |          |       |          |              |       |          | 7  |          | 3     |          | 6  |          | 3     |          |       |          |
| 1         | 2  |          | 1     |          |              |       |          | 6  |          | 2     |          | 7  |          | 6     |          |       |          |
| 2         | 5  |          |       |          |              |       |          | 3  |          | 3     |          | 10 |          | 3     |          |       |          |
| 3         | 2  |          |       |          |              |       |          | 3  |          | 4     |          | 11 |          | 4     |          |       |          |
| 4         |    |          |       |          |              |       |          | 5  |          | 7     |          | 9  |          | 3     |          |       |          |
| 5         | 1  |          |       |          |              |       |          | 9  |          | 5     |          | 4  |          | 4     |          |       |          |
| 6         | 2  |          |       |          |              |       |          | 14 |          | 4     |          | 3  |          | 2     |          |       |          |
| 7         | 2  |          |       |          |              |       |          | 13 |          | 5     |          | 3  |          | 2     |          | 1     |          |
| 8         | 2  |          |       |          |              |       |          | 13 |          | 5     |          | 2  |          | 2     |          | 1     |          |
| 9         | 2  |          |       |          |              |       |          | 14 |          | 5     |          | 2  |          | 1     |          | 1     |          |
| 10        | 2  |          |       |          |              |       |          | 14 |          | 5     |          | 2  |          | 1     |          | 1     |          |
| 11        | 2  |          |       |          |              |       |          | 14 |          | 4     |          | 2  |          | 1     |          |       |          |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1863.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.

Height of the Cistern of the Standard Barometer above the Sea-level, 18.11.

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 29.743                                          | 29.817                                    | 29.661  | 0.156   | 85.0                          | 94.6                                          | 78.6 | 16.0  |
| 2     | .711                                            | .792                                      | .611    | .181    | 83.8                          | 93.8                                          | 76.8 | 17.0  |
| 3     | .648                                            | .720                                      | .539    | .181    | 84.7                          | 94.6                                          | 75.6 | 19.0  |
| 4     | .588                                            | .651                                      | .506    | .145    | 86.0                          | 95.2                                          | 77.2 | 18.0  |
| 5     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 6     | .595                                            | .673                                      | .507    | .166    | 87.3                          | 99.8                                          | 79.4 | 20.4  |
| 7     | .578                                            | .645                                      | .506    | .139    | 87.1                          | 97.2                                          | 81.0 | 16.2  |
| 8     | .688                                            | .776                                      | .604    | .172    | 83.1                          | 92.6                                          | 69.8 | 22.8  |
| 9     | .767                                            | .832                                      | .714    | .118    | 84.0                          | 92.8                                          | 75.8 | 17.0  |
| 10    | .776                                            | .842                                      | .715    | .127    | 85.0                          | 91.8                                          | 79.4 | 12.4  |
| 11    | .731                                            | .793                                      | .630    | .163    | 84.5                          | 92.8                                          | 77.6 | 15.2  |
| 12    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 13    | .683                                            | .751                                      | .608    | .143    | 83.4                          | 92.0                                          | 74.4 | 17.6  |
| 14    | .728                                            | .800                                      | .649    | .151    | 84.5                          | 91.2                                          | 79.4 | 11.8  |
| 15    | .760                                            | .837                                      | .667    | .170    | 84.7                          | 93.0                                          | 74.6 | 18.4  |
| 16    | .731                                            | .802                                      | .662    | .140    | 80.8                          | 90.4                                          | 72.8 | 17.6  |
| 17    | .698                                            | .770                                      | .613    | .157    | 83.5                          | 93.0                                          | 76.8 | 16.2  |
| 18    | .724                                            | .800                                      | .665    | .135    | 84.0                          | 92.8                                          | 77.2 | 15.6  |
| 19    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 20    | .741                                            | .821                                      | .684    | .137    | 82.7                          | 92.7                                          | 74.2 | 18.5  |
| 21    | .773                                            | .849                                      | .701    | .148    | 84.8                          | 95.0                                          | 76.4 | 18.6  |
| 22    | .759                                            | .830                                      | .694    | .136    | 85.2                          | 94.8                                          | 78.4 | 16.4  |
| 23    | .755                                            | .823                                      | .681    | .142    | 85.3                          | 94.8                                          | 78.2 | 16.6  |
| 24    | .721                                            | .793                                      | .640    | .153    | 85.9                          | 94.8                                          | 79.8 | 15.0  |
| 25    | .702                                            | .786                                      | .593    | .193    | 83.1                          | 90.4                                          | 75.0 | 15.4  |
| 26    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 27    | .716                                            | .788                                      | .634    | .154    | 84.5                          | 95.6                                          | 75.2 | 20.4  |
| 28    | .686                                            | .766                                      | .570    | .196    | 86.5                          | 95.2                                          | 77.8 | 17.4  |
| 29    | .654                                            | .733                                      | .523    | .210    | 84.2                          | 94.5                                          | 76.0 | 18.5  |
| 30    | .645                                            | .706                                      | .597    | .109    | 80.2                          | 87.2                                          | 74.1 | 13.1  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly Observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1863.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Date. | Mean Wet Bulb Thermo-<br>meter. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a Cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humidity,<br>complete saturation be-<br>ing unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|
|       | °                               | °                   | °                   | °                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                   |
| 1     | 77.5                            | 7.5                 | 72.2                | 12.8                         | .0781                            | 8.33                                             | 4.20                                                                    | .67                                                               |
| 2     | 76.3                            | 8.5                 | 69.3                | 14.5                         | .711                             | 7.60                                             | .50                                                                     | .63                                                               |
| 3     | 77.1                            | 7.6                 | 71.8                | 12.9                         | .771                             | 8.23                                             | .19                                                                     | .66                                                               |
| 4     | 78.9                            | 7.1                 | 73.9                | 12.1                         | .824                             | .79                                              | .12                                                                     | .68                                                               |
| 5     | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 6     | 76.8                            | 10.5                | 70.5                | 16.8                         | .739                             | 7.85                                             | 5.56                                                                    | .59                                                               |
| 7     | 79.3                            | 7.8                 | 74.6                | 12.5                         | .843                             | 8.96                                             | 4.37                                                                    | .67                                                               |
| 8     | 76.8                            | 6.3                 | 72.4                | 10.7                         | .785                             | .41                                              | 3.45                                                                    | .71                                                               |
| 9     | 78.0                            | 6.0                 | 73.8                | 10.2                         | .822                             | .80                                              | .37                                                                     | .72                                                               |
| 10    | 78.8                            | 6.2                 | 74.5                | 10.5                         | .840                             | .98                                              | .55                                                                     | .72                                                               |
| 11    | 78.4                            | 6.1                 | 74.1                | 10.4                         | .830                             | .89                                              | .46                                                                     | .72                                                               |
| 12    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 13    | 76.8                            | 6.6                 | 72.2                | 11.2                         | .781                             | .36                                              | .60                                                                     | .70                                                               |
| 14    | 78.7                            | 5.8                 | 74.6                | 9.9                          | .843                             | 9.02                                             | .33                                                                     | .73                                                               |
| 15    | 78.5                            | 6.2                 | 74.2                | 10.5                         | .832                             | 8.89                                             | .53                                                                     | .72                                                               |
| 16    | 75.4                            | 5.4                 | 71.6                | 9.2                          | .766                             | .25                                              | 2.82                                                                    | .75                                                               |
| 17    | 77.9                            | 5.6                 | 74.0                | 9.5                          | .827                             | .86                                              | 3.14                                                                    | .74                                                               |
| 18    | 79.1                            | 4.9                 | 75.7                | 8.3                          | .873                             | 9.36                                             | 2.81                                                                    | .77                                                               |
| 19    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 20    | 76.6                            | 6.1                 | 72.3                | 10.4                         | .783                             | 8.41                                             | 3.31                                                                    | .72                                                               |
| 21    | 77.7                            | 7.1                 | 72.7                | 12.1                         | .792                             | .47                                              | .99                                                                     | .68                                                               |
| 22    | 78.1                            | 7.1                 | 73.1                | 12.1                         | .803                             | .58                                              | 4.03                                                                    | .68                                                               |
| 23    | 78.3                            | 7.0                 | 73.4                | 11.9                         | .811                             | .66                                              | 3.98                                                                    | .69                                                               |
| 24    | 78.4                            | 7.5                 | 73.1                | 12.8                         | .803                             | .56                                              | 4.31                                                                    | .67                                                               |
| 25    | 75.8                            | 7.3                 | 70.7                | 12.4                         | .744                             | 7.98                                             | 3.88                                                                    | .67                                                               |
| 26    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 27    | 77.2                            | 7.3                 | 72.1                | 12.4                         | .778                             | 8.33                                             | 4.02                                                                    | .67                                                               |
| 28    | 76.5                            | 10.0                | 70.5                | 16.0                         | .739                             | 7.87                                             | 5.23                                                                    | .60                                                               |
| 29    | 77.0                            | 7.2                 | 72.0                | 12.2                         | .776                             | 8.30                                             | 3.94                                                                    | .68                                                               |
| 30    | 74.6                            | 5.6                 | 70.7                | 9.5                          | .744                             | .02                                              | 2.86                                                                    | .74                                                               |

All the Hygrometrical elements are computed by the Greenwich Constants.

From the 1st January, 1863, the Greenwich New Factors have been used  
for computing Dew-point.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer for<br>each hour during the<br>month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture for each hour<br>during the<br>month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|---------------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                                | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                                   | o    | o     |
| Mid-<br>night. | 29.717                                          | 29.798                                                       | 29.579  | 0.219   | 79.3                          | 82.4                                                                | 74.4 | 8.0   |
| 1              | .704                                            | .786                                                         | .571    | .215    | 79.3                          | 82.9                                                                | 74.4 | 8.5   |
| 2              | .695                                            | .776                                                         | .566    | .210    | 78.8                          | 82.0                                                                | 74.2 | 7.8   |
| 3              | .688                                            | .773                                                         | .561    | .212    | 78.5                          | 81.6                                                                | 74.0 | 7.6   |
| 4              | .684                                            | .782                                                         | .551    | .231    | 78.7                          | 81.4                                                                | 74.3 | 7.1   |
| 5              | .715                                            | .793                                                         | .606    | .187    | 78.2                          | 80.8                                                                | 73.0 | 7.8   |
| 6              | .716                                            | .804                                                         | .589    | .215    | 78.3                          | 81.0                                                                | 72.8 | 8.2   |
| 7              | .733                                            | .820                                                         | .595    | .225    | 79.2                          | 82.2                                                                | 74.2 | 8.0   |
| 8              | .764                                            | .838                                                         | .607    | .231    | 82.4                          | 86.2                                                                | 76.8 | 9.4   |
| 9              | .775                                            | .842                                                         | .620    | .222    | 85.2                          | 88.8                                                                | 77.0 | 11.8  |
| 10             | .769                                            | .849                                                         | .645    | .204    | 87.7                          | 90.8                                                                | 78.8 | 12.0  |
| 11             | .756                                            | .831                                                         | .625    | .206    | 90.0                          | 93.6                                                                | 78.6 | 15.0  |
| Noon.          | .738                                            | .815                                                         | .599    | .216    | 91.5                          | 95.6                                                                | 81.6 | 14.0  |
| 1              | .708                                            | .781                                                         | .580    | .201    | 92.7                          | 97.0                                                                | 83.8 | 13.2  |
| 2              | .680                                            | .761                                                         | .556    | .205    | 93.1                          | 97.6                                                                | 85.4 | 12.2  |
| 3              | .655                                            | .734                                                         | .523    | .211    | 93.0                          | 99.2                                                                | 86.6 | 12.6  |
| 4              | .634                                            | .720                                                         | .507    | .213    | 91.5                          | 99.8                                                                | 86.8 | 13.0  |
| 5              | .635                                            | .719                                                         | .506    | .213    | 89.4                          | 96.7                                                                | 85.2 | 11.5  |
| 6              | .644                                            | .745                                                         | .506    | .239    | 86.1                          | 92.0                                                                | 69.8 | 22.2  |
| 7              | .666                                            | .788                                                         | .525    | .263    | 84.1                          | 89.6                                                                | 72.4 | 17.2  |
| 8              | .684                                            | .763                                                         | .533    | .230    | 82.5                          | 89.0                                                                | 74.4 | 14.6  |
| 9              | .709                                            | .832                                                         | .543    | .289    | 81.8                          | 86.6                                                                | 74.2 | 12.4  |
| 10             | .721                                            | .823                                                         | .573    | .250    | 80.9                          | 84.0                                                                | 75.6 | 8.4   |
| 11             | .721                                            | .818                                                         | .594    | .224    | 79.9                          | 83.6                                                                | 74.6 | 9.0   |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the Observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Hour.      | Mean Wet Bulb Thermometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew Point. | Mean Elastic force of Vapour. | Mean Weight of Vapour in a Cubic foot of air. | Additional Weight of Vapour required for complete saturation. | Mean degree of Humidity, complete saturation being unity. |
|------------|----------------------------|---------------------|---------------------|---------------------------|-------------------------------|-----------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------|
|            | °                          | °                   | °                   | °                         | Inches.                       | Troy grs.                                     | Troy grs.                                                     |                                                           |
| Mid-night. | 75.4                       | 3.9                 | 72.7                | 6.6                       | 0.792                         | 8.56                                          | 2.03                                                          | 0.81                                                      |
| 1          | 75.4                       | 3.9                 | 72.7                | 6.6                       | .792                          | .56                                           | .03                                                           | .81                                                       |
| 2          | 75.4                       | 3.4                 | 73.0                | 5.8                       | .801                          | .65                                           | 1.79                                                          | .83                                                       |
| 3          | 75.3                       | 3.2                 | 73.1                | 5.4                       | .803                          | .70                                           | .65                                                           | .84                                                       |
| 4          | 75.8                       | 2.9                 | 73.8                | 4.9                       | .822                          | .89                                           | .52                                                           | .85                                                       |
| 5          | 75.5                       | 2.7                 | 73.6                | 4.6                       | .817                          | .84                                           | .41                                                           | .86                                                       |
| 6          | 75.7                       | 2.6                 | 73.9                | 4.4                       | .824                          | .94                                           | .34                                                           | .87                                                       |
| 7          | 76.3                       | 2.9                 | 74.3                | 4.9                       | .835                          | 9.03                                          | .53                                                           | .86                                                       |
| 8          | 77.9                       | 4.5                 | 74.7                | 7.7                       | .846                          | .08                                           | 2.53                                                          | .78                                                       |
| 9          | 78.7                       | 6.5                 | 74.1                | 11.1                      | .830                          | 8.87                                          | 3.74                                                          | .70                                                       |
| 10         | 79.6                       | 8.1                 | 74.7                | 13.0                      | .846                          | .99                                           | 4.57                                                          | .66                                                       |
| 11         | 80.2                       | 9.8                 | 74.3                | 15.7                      | .835                          | .83                                           | 5.67                                                          | .61                                                       |
| Noon.      | 80.5                       | 11.0                | 73.9                | 17.6                      | .824                          | .69                                           | 6.46                                                          | .57                                                       |
| 1          | 80.0                       | 12.7                | 72.4                | 20.3                      | .785                          | .26                                           | 7.42                                                          | .53                                                       |
| 2          | 80.1                       | 13.0                | 72.3                | 20.8                      | .783                          | .22                                           | .64                                                           | .52                                                       |
| 3          | 80.1                       | 12.9                | 72.4                | 20.6                      | .785                          | .24                                           | .57                                                           | .52                                                       |
| 4          | 79.3                       | 12.2                | 72.0                | 19.5                      | .776                          | .16                                           | 6.99                                                          | .54                                                       |
| 5          | 78.7                       | 10.7                | 72.3                | 17.1                      | .783                          | .29                                           | 5.96                                                          | .58                                                       |
| 6          | 77.4                       | 8.7                 | 71.3                | 14.8                      | .758                          | .08                                           | 4.87                                                          | .62                                                       |
| 7          | 76.6                       | 7.5                 | 71.3                | 12.8                      | .758                          | .11                                           | .10                                                           | .66                                                       |
| 8          | 76.2                       | 6.3                 | 71.8                | 10.7                      | .771                          | .26                                           | 3.38                                                          | .71                                                       |
| 9          | 76.2                       | 5.6                 | 72.3                | 9.5                       | .783                          | .41                                           | 2.99                                                          | .74                                                       |
| 10         | 75.7                       | 5.2                 | 72.1                | 8.8                       | .778                          | .38                                           | .72                                                           | .76                                                       |
| 11         | 75.5                       | 4.4                 | 72.4                | 7.5                       | .785                          | .46                                           | .32                                                           | .79                                                       |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January, 1863, the Greenwich New Factors have been used  
for Computing Dew-point.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1863.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                                   |
|-------|-----------------------|---------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
|       | °                     | Inches                          |                                   |                                                                                                                                              |
| 1     | 128.0                 | ...                             | S.                                | Cloudless till 3 A. M. Scatd. clouds afterwards; also slightly drizzling at 5 P. M.                                                          |
| 2     | 131.8                 | ...                             | S. & E.                           | Cloudy till 6 A. M. Scatd. $\searrow$ & $\nearrow$ till 2 P. M. cloudy till 7 P. M. cloudless afterwards; also slightly drizzling at 7 P. M. |
| 3     | 135.0                 | ...                             | S.                                | Cloudless till 5 P. M. Scatd. $\searrow$ afterwards.                                                                                         |
| 4     | 133.0                 | ...                             | S.                                | Cloudless till 3 P. M. Scatd. clouds afterwards.                                                                                             |
| 5     | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                                              |
| 6     | 137.0                 | ...                             | S. & S. E. & W.                   | Scatd. $\searrow$ till 9 A. M. cloudless afterwards.                                                                                         |
| 7     | 132.0                 | ...                             | S.                                | Cloudy till 6 A. M. Scatd. $\searrow$ till 10 A. M. cloudless afterwards.                                                                    |
| 8     | 129.6                 | 0.58                            | S.                                | Cloudless till 6 A. M. Scatd. $\nearrow$ till 4 P. M. cloudy afterwards; also thundering, lightning, hailing & raining at 6 P. M.            |
| 9     | 130.0                 | ...                             | S.                                | Scatd. $\searrow$ till 5 P. M. cloudy till 9 P. M. cloudless afterwards; also slightly drizzling between 8 & 9 P. M.                         |
| 10    | 126.0                 | ...                             | S. & S. E.                        | Cloudless till 3 A. M. Scatd. $\searrow$ & $\nearrow$ till 4 P. M. cloudy till 9 P. M. cloudless afterwards.                                 |
| 11    | 126.2                 | ...                             | S.                                | Cloudless till 2 A. M. Scatd. $\searrow$ & $\nearrow$ till 6 P. M. cloudy afterwards; also flashes of lightning between 7 & 9 P. M.          |
| 12    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                                              |
| 13    | 129.0                 | ...                             | S. & S. W.                        | Cloudless till 7 A. M. Scatd. clouds till 4 P. M. cloudy afterwards; also thunder & lightning between 6 & 9 P. M.                            |
| 14    | 123.0                 | ...                             | S. & E.                           | Scatd. clouds till 6 A. M. Scatd. $\searrow$ till 3 P. M. cloudy afterwards; also raining between 4 & 5 A. M.                                |
| 15    | 127.0                 | 0.29                            | S. & E.                           | Cloudy till 8 A. M. Scatd. $\searrow$ & $\nearrow$ till 5 P. M. cloudy afterwards; also thundering, lightning & raining at 10 & 11 P. M.     |
| 16    | 126.5                 | ...                             | S.                                | Cloudy till 9 A. M. Scatd. $\searrow$ till 4 P. M. cloudless afterwards.                                                                     |
| 17    | 128.0                 | 0.39                            | S. & W.                           | Scatd. $\searrow$ till 4 P. M. cloudy afterwards; also thundering & lightning between 6 & 10 P. M.; also raining at 7 A. M. & 6 P. M.        |
| 18    | 130.0                 | ...                             | S. & S. W.                        | Scatd. clouds.                                                                                                                               |



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1863.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                           |
|-------|-----------------------|---------------------------------|-----------------------------------|--------------------------------------------------------------------------------------|
|       | °                     | Inches.                         |                                   |                                                                                      |
| 19    | ...                   | 0.78                            | <i>Sunday.</i>                    |                                                                                      |
| 20    | 135.0                 | ...                             | S.                                | Cloudy till 7 A. M. Scatd. ☉ & ☾ till 7 P. M. cloudless afterwards.                  |
| 21    | 138.0                 | ...                             | S. & S. E.                        | Cloudless.                                                                           |
| 22    | 134.0                 | ...                             | S.                                | Cloudless.                                                                           |
| 23    | 132.0                 | ...                             | S. E. & S.                        | Cloudless.                                                                           |
| 24    | 131.2                 | ...                             | S. & S. W.                        | Scatd. ☉ & ☾ till 3 P. M. cloudy afterwards; also thundering & drizzling at 4 P. M.  |
| 25    | 133.0                 | ...                             | S. & S. E.                        | Cloudy till Noon. Scatd. ☾ & ☾ till 8 P. M. cloudless afterwards.                    |
| 26    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                      |
| 27    | 137.0                 | ...                             | S.                                | Cloudless till 1 P. M. Scatd. ☉ till 5 P. M. cloudless afterwards.                   |
| 28    | 130.0                 | ...                             | S.                                | Cloudless till 4 P. M. Scatd. ☾ afterwards.                                          |
| 29    | 129.6                 | ...                             | S. & S. E. & N. W.                | Scatd. ☉ & ☾ till 3 P. M. cloudy afterwards.                                         |
| 30    | 127.0                 | 0.39                            | E. & S. E.                        | Cloudy till 10 A. M. cloudless afterwards; also raining at Midnight, 1 A. M. & Noon. |

☉ Cirri, ☾ Cirro strati, ☉ Cumuli, ☉ Cumulo strati, ☾ Nimbi, — Strati, ☾ Cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1863.*

MONTHLY RESULTS.

|                                                                        |    |    | Inches |
|------------------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month,                            | .. | .. | 29.705 |
| Max. height of the Barometer occurred at 10 A. M. on the 21st,         | .. | .. | 29.849 |
| Min. height of the Barometer occurred at 5 & 6 P. M. on the 4th & 7th, | .. | .. | 29.506 |
| <i>Extreme range</i> of the Barometer during the month,                | .. | .. | 0.343  |
| Mean of the daily Max. Pressures,                                      | .. | .. | 29.777 |
| Ditto ditto Min. ditto,                                                | .. | .. | 29.622 |
| <i>Mean daily range</i> of the Barometer during the month,             | .. | .. | 0.155  |

|                                                              |    |    |      |
|--------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                     | .. | .. | 84.4 |
| Max. Temperature occurred at 4 P. M. on the 6th,             | .. | .. | 99.8 |
| Min. Temperature occurred at 6 P. M. on the 8th,             | .. | .. | 69.8 |
| <i>Extreme range</i> of the Temperature during the month,    | .. | .. | 30.0 |
| Mean of the daily Max. Temperature,                          | .. | .. | 93.6 |
| Ditto ditto Min. ditto,                                      | .. | .. | 76.6 |
| <i>Mean daily range</i> of the Temperature during the month, | .. | .. | 17.0 |

|                                                               |    |    |        |
|---------------------------------------------------------------|----|----|--------|
|                                                               |    |    | °      |
| Mean Wet Bulb Thermometer for the month,                      | .. | .. | 77.4   |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, .. | .. | .. | 7.0    |
| Computed Mean Dew-point for the month,                        | .. | .. | 72.5   |
| Mean Dry Bulb Thermometer above computed Mean Dew-point, ..   | .. | .. | 11.9   |
|                                                               |    |    | Inches |
| Mean Elastic force of Vapour for the month, ..                | .. | .. | 0.787  |

|                                                                         |    |    |             |
|-------------------------------------------------------------------------|----|----|-------------|
|                                                                         |    |    | Troy grains |
| Mean Weight of Vapour for the month, ..                                 | .. | .. | 8.42        |
| Additional Weight of Vapour required for complete saturation, ..        | .. | .. | 3.89        |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.68        |

|                                                       |    |    |        |
|-------------------------------------------------------|----|----|--------|
|                                                       |    |    | Inches |
| Rained 10 days, Max. fall of rain during 24 hours, .. | .. | .. | 0.78   |
| Total amount of rain during the month, ..             | .. | .. | 2.43   |
| Prevailing direction of the Wind, ..                  | .. | .. | S.     |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1863.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on.<br>N. | E. | Rain on.<br>E. | S. E. | Rain on.<br>S. E. | S. | Rain on.<br>S. | S. W. | Rain on.<br>S. W. | W. | Rain on.<br>W. | N. W. | Rain on.<br>N. W. | Calm. | Rain on.<br>Calm. | Missed. |
|-----------|--------------|----------------|----|----------------|-------|-------------------|----|----------------|-------|-------------------|----|----------------|-------|-------------------|-------|-------------------|---------|
|           | No. of days. |                |    |                |       |                   |    |                |       |                   |    |                |       |                   |       |                   |         |
| Midnight. |              |                |    |                |       |                   |    |                |       |                   |    |                |       |                   |       |                   |         |
| 1         |              |                |    |                |       | 7                 | 1  | 12             |       |                   |    |                |       |                   |       |                   | 3       |
| 2         |              |                |    |                |       | 5                 | 1  | 16             |       |                   |    |                |       |                   |       |                   | 1       |
| 3         |              |                |    |                |       | 4                 |    | 17             |       |                   |    |                |       |                   |       |                   | 1       |
| 4         |              |                |    |                |       | 5                 |    | 16             |       |                   |    |                |       |                   |       |                   | 4       |
| 5         |              |                |    |                |       | 5                 |    | 12             |       |                   |    |                |       |                   | 1     |                   | 4       |
| 6         |              |                |    |                |       | 6                 | 1  | 11             |       |                   |    |                |       |                   | 1     |                   | 4       |
| 7         |              |                |    |                |       | 8                 |    | 16             |       |                   |    |                |       |                   |       |                   |         |
| 8         |              |                |    |                |       | 8                 |    | 13             | 1     |                   |    |                |       |                   |       |                   | 2       |
| 9         |              |                |    |                |       | 4                 |    | 15             | 2     |                   | 1  | 1              |       |                   |       |                   | 1       |
| 10        |              |                |    |                |       | 4                 |    | 19             | 2     |                   |    |                |       |                   |       |                   |         |
| 11        |              | 1              |    |                |       | 3                 |    | 18             | 5     |                   |    |                |       |                   |       |                   |         |
|           |              |                |    |                |       | 4                 |    | 17             | 3     |                   | 1  |                |       |                   |       |                   |         |
| Noon.     |              |                |    |                |       |                   |    |                |       |                   |    |                |       |                   |       |                   |         |
| 1         |              |                |    |                |       | 1                 |    | 19             | 6     |                   |    |                |       |                   |       |                   |         |
| 2         |              |                |    |                |       | 2                 |    | 20             | 2     |                   | 1  |                |       |                   |       |                   |         |
| 3         |              |                |    |                |       | 1                 |    | 16             | 6     |                   | 1  |                |       |                   |       |                   |         |
| 4         |              |                |    |                |       | 1                 |    | 18             | 5     |                   | 1  |                |       |                   |       |                   |         |
| 5         |              |                |    |                |       | 4                 |    | 15             | 5     | 1                 |    |                |       |                   |       |                   |         |
| 6         |              |                |    |                |       | 3                 |    | 20             | 1     |                   |    |                | 1     | 1                 |       |                   | 1       |
| 7         |              | 1              | 1  |                |       | 2                 |    | 19             | 1     |                   | 2  | 1              |       | 1                 |       |                   |         |
| 8         |              | 1              |    |                |       | 3                 |    | 20             |       |                   | 1  |                |       | 1                 |       |                   |         |
| 9         |              | 1              |    |                |       | 2                 |    | 19             |       |                   | 1  |                |       | 1                 | 1     |                   | 1       |
| 10        | 1            | 1              |    |                |       | 3                 |    | 19             | 1     |                   | 1  |                |       | 1                 |       |                   | 1       |
| 11        |              |                |    |                |       | 5                 |    | 15             |       |                   | 2  |                |       | 1                 | 1     |                   |         |
|           |              |                |    |                |       | 4                 |    | 15             |       |                   |    |                |       | 1                 |       |                   |         |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1863.*

• Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.

Height-of the Cistern of the Standard Barometer above the Sea-level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fah. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                        | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 29.647                                         | 29.712                                    | 29.538  | 0.174   | 85.9                          | 96.8                                          | 76.6 | 20.2  |
| 2     | .643                                           | .706                                      | .543    | .163    | 87.4                          | 95.4                                          | 80.4 | 15.0  |
| 3     | Sunday.                                        |                                           |         |         |                               |                                               |      |       |
| 4     | .670                                           | .714                                      | .601    | .113    | 79.4                          | 92.1                                          | 74.6 | 17.5  |
| 5     | .689                                           | .743                                      | .622    | .121    | 81.5                          | 90.4                                          | 75.0 | 15.4  |
| 6     | .704                                           | .757                                      | .640    | .117    | 77.6                          | 85.6                                          | 74.6 | 11.0  |
| 7     | .722                                           | .798                                      | .659    | .139    | 81.0                          | 87.5                                          | 74.0 | 13.5  |
| 8     | .631                                           | .708                                      | .555    | .153    | 80.8                          | 84.4                                          | 75.4 | 9.0   |
| 9     | .624                                           | .683                                      | .574    | .109    | 83.7                          | 92.7                                          | 75.6 | 17.1  |
| 10    | Sunday.                                        |                                           |         |         |                               |                                               |      |       |
| 11    | .654                                           | .717                                      | .575    | .142    | 87.0                          | 93.2                                          | 82.0 | 11.2  |
| 12    | .631                                           | .720                                      | .549    | .171    | 86.7                          | 93.6                                          | 82.2 | 11.4  |
| 13    | .657                                           | .724                                      | .595    | .129    | 85.3                          | 92.6                                          | 76.7 | 15.9  |
| 14    | .664                                           | .727                                      | .597    | .130    | 85.8                          | 93.6                                          | 78.7 | 14.9  |
| 15    | .656                                           | .715                                      | .583    | .132    | 87.6                          | 94.9                                          | 82.2 | 12.7  |
| 16    | .677                                           | .736                                      | .606    | .130    | 86.5                          | 93.8                                          | 81.8 | 12.0  |
| 17    | Sunday.                                        |                                           |         |         |                               |                                               |      |       |
| 18    | .630                                           | .722                                      | .551    | .171    | 87.8                          | 94.8                                          | 80.4 | 14.4  |
| 19    | .601                                           | .675                                      | .522    | .153    | 86.4                          | 95.0                                          | 79.0 | 16.0  |
| 20    | .551                                           | .620                                      | .455    | .165    | 86.8                          | 98.0                                          | 74.6 | 23.4  |
| 21    | .574                                           | .691                                      | .513    | .178    | 83.9                          | 92.4                                          | 77.0 | 15.4  |
| 22    | .614                                           | .707                                      | .517    | .190    | 85.1                          | 94.6                                          | 76.3 | 18.3  |
| 23    | .656                                           | .745                                      | .564    | .181    | 86.2                          | 94.6                                          | 78.8 | 15.8  |
| 24    | Sunday.                                        |                                           |         |         |                               |                                               |      |       |
| 25    | .666                                           | .722                                      | .582    | .140    | 87.1                          | 97.0                                          | 79.4 | 17.6  |
| 26    | .615                                           | .672                                      | .523    | .149    | 88.2                          | 97.6                                          | 79.2 | 18.4  |
| 27    | .574                                           | .654                                      | .491    | .163    | 90.0                          | 100.4                                         | 83.6 | 16.8  |
| 28    | .535                                           | .600                                      | .450    | .150    | 90.0                          | 100.6                                         | 83.1 | 17.5  |
| 29    | .499                                           | .560                                      | .414    | .146    | 90.5                          | 104.0                                         | 83.2 | 20.8  |
| 30    | .470                                           | .523                                      | .373    | .150    | 91.4                          | 101.4                                         | 84.8 | 16.6  |
| 31    | Sunday.                                        |                                           |         |         |                               |                                               |      |       |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly Observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1863.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a Cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humi-<br>dity, complete satura-<br>tion being unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------|
| 1     | o<br>79.0                       | o<br>6.9            | o<br>74.2           | o<br>11.7                    | Inches.<br>0.832                 | T. gr.<br>8.87                                   | T. gr.<br>4.00                                                          | 0.69                                                                |
| 2     | 81.0                            | 6.4                 | 77.2                | 10.2                         | .916                             | 9.75                                             | 3.70                                                                    | .73                                                                 |
| 3     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 4     | 74.8                            | 4.6                 | 71.6                | 7.8                          | .766                             | 8.27                                             | 2.35                                                                    | .78                                                                 |
| 5     | 77.1                            | 4.4                 | 74.0                | 7.5                          | .827                             | .90                                              | .41                                                                     | .79                                                                 |
| 6     | 74.4                            | 3.2                 | 72.2                | 5.4                          | .781                             | .46                                              | 1.61                                                                    | .84                                                                 |
| 7     | 76.5                            | 4.5                 | 73.3                | 7.7                          | .809                             | .70                                              | 2.44                                                                    | .78                                                                 |
| 8     | 77.7                            | 3.1                 | 75.5                | 5.3                          | .868                             | 9.37                                             | 1.70                                                                    | .85                                                                 |
| 9     | 78.8                            | 4.9                 | 75.4                | 8.3                          | .865                             | .28                                              | 2.79                                                                    | .77                                                                 |
| 10    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 11    | 81.2                            | 5.8                 | 77.7                | 9.3                          | .931                             | .92                                              | 3.37                                                                    | .75                                                                 |
| 12    | 80.1                            | 6.6                 | 76.1                | 10.6                         | .885                             | .42                                              | .76                                                                     | .72                                                                 |
| 13    | 77.9                            | 7.4                 | 72.7                | 12.6                         | .792                             | 8.45                                             | 4.19                                                                    | .67                                                                 |
| 14    | 79.1                            | 6.7                 | 74.4                | 11.4                         | .838                             | .95                                              | 3.88                                                                    | .70                                                                 |
| 15    | 80.0                            | 7.6                 | 75.4                | 12.2                         | .865                             | 9.20                                             | 4.32                                                                    | .68                                                                 |
| 16    | 80.0                            | 6.5                 | 76.1                | 10.4                         | .885                             | .44                                              | 3.66                                                                    | .72                                                                 |
| 17    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 18    | 80.1                            | 7.7                 | 75.5                | 12.3                         | .868                             | .23                                              | 4.37                                                                    | .68                                                                 |
| 19    | 79.4                            | 7.0                 | 74.5                | 11.9                         | .840                             | 8.96                                             | .10                                                                     | .69                                                                 |
| 20    | 80.1                            | 6.7                 | 76.1                | 10.7                         | .885                             | 9.42                                             | 3.79                                                                    | .71                                                                 |
| 21    | 78.3                            | 5.6                 | 74.4                | 9.5                          | .838                             | 8.97                                             | .16                                                                     | .74                                                                 |
| 22    | 79.1                            | 6.0                 | 74.9                | 10.2                         | .851                             | 9.09                                             | .48                                                                     | .72                                                                 |
| 23    | 78.9                            | 7.3                 | 73.8                | 12.4                         | .822                             | 8.76                                             | 4.23                                                                    | .67                                                                 |
| 24    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 25    | 80.5                            | 6.6                 | 76.5                | 10.6                         | .896                             | 9.54                                             | 3.79                                                                    | .72                                                                 |
| 26    | 81.6                            | 6.6                 | 77.6                | 10.6                         | .928                             | .85                                              | .91                                                                     | .72                                                                 |
| 27    | 82.6                            | 7.4                 | 78.2                | 11.8                         | .946                             | 10.00                                            | 4.50                                                                    | .69                                                                 |
| 28    | 81.9                            | 8.1                 | 77.0                | 13.0                         | .910                             | 9.63                                             | .87                                                                     | .66                                                                 |
| 29    | 80.2                            | 10.3                | 74.0                | 16.5                         | .827                             | 8.73                                             | 5.99                                                                    | .59                                                                 |
| 30    | 80.9                            | 10.5                | 74.6                | 16.8                         | .843                             | .89                                              | 6.21                                                                    | .59                                                                 |
| 31    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |

All the Hygrometrical elements are computed by the Greenwich Constants.

From the 1st January, 1863, the Greenwich New Factors have been used for  
Computing Dew-point.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1863.*

\* Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>for each hour during<br>the month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Temperature<br>for each hour during<br>the month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|----------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                           | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | °                             | °                                                              | °    | °     |
| Mid-<br>night. | 29.635                                          | 29.722                                                       | 29.509  | 0.213   | 80.8                          | 86.2                                                           | 75.0 | 11.2  |
| 1              | .630                                            | .717                                                         | .491    | .226    | 80.7                          | 86.0                                                           | 75.0 | 11.0  |
| 2              | .617                                            | .709                                                         | .485    | .224    | 80.6                          | 85.2                                                           | 74.6 | 10.6  |
| 3              | .612                                            | .707                                                         | .481    | .226    | 80.4                          | 85.2                                                           | 74.4 | 10.8  |
| 4              | .610                                            | .708                                                         | .489    | .219    | 80.9                          | 85.2                                                           | 74.2 | 11.0  |
| 5              | .627                                            | .735                                                         | .491    | .244    | 80.2                          | 85.2                                                           | 74.0 | 11.2  |
| 6              | .643                                            | .747                                                         | .495    | .252    | 80.3                          | 85.6                                                           | 74.2 | 11.4  |
| 7              | .657                                            | .757                                                         | .508    | .249    | 81.8                          | 87.4                                                           | 75.6 | 11.8  |
| 8              | .674                                            | .784                                                         | .523    | .261    | 85.0                          | 90.6                                                           | 80.4 | 10.2  |
| 9              | .683                                            | .785                                                         | .523    | .262    | 87.3                          | 92.6                                                           | 80.0 | 12.6  |
| 10             | .682                                            | .798                                                         | .521    | .277    | 89.9                          | 95.4                                                           | 84.4 | 11.0  |
| 11             | .669                                            | .782                                                         | .511    | .271    | 91.5                          | 97.8                                                           | 78.9 | 18.9  |
| Noon.          | .649                                            | .762                                                         | .495    | .267    | 92.2                          | 99.8                                                           | 77.2 | 22.6  |
| 1              | .622                                            | .738                                                         | .462    | .276    | 93.1                          | 101.4                                                          | 75.4 | 26.0  |
| 2              | .597                                            | .698                                                         | .434    | .264    | 92.9                          | 102.4                                                          | 76.6 | 25.8  |
| 3              | .576                                            | .681                                                         | .406    | .275    | 92.7                          | 103.6                                                          | 75.8 | 27.8  |
| 4              | .559                                            | .676                                                         | .373    | .303    | 91.6                          | 104.0                                                          | 74.8 | 29.2  |
| 5              | .552                                            | .661                                                         | .376    | .285    | 90.2                          | 99.6                                                           | 75.0 | 24.6  |
| 6              | .565                                            | .669                                                         | .381    | .288    | 87.6                          | 95.0                                                           | 74.9 | 20.1  |
| 7              | .592                                            | .683                                                         | .397    | .286    | 85.3                          | 94.1                                                           | 74.6 | 19.5  |
| 8              | .623                                            | .707                                                         | .446    | .261    | 83.6                          | 88.4                                                           | 74.6 | 13.8  |
| 9              | .637                                            | .723                                                         | .470    | .253    | 82.8                          | 87.0                                                           | 74.8 | 12.2  |
| 10             | .639                                            | .728                                                         | .483    | .245    | 82.5                          | 86.4                                                           | 75.0 | 11.4  |
| 11             | .643                                            | .728                                                         | .474    | .254    | 81.9                          | 86.6                                                           | 74.6 | 12.0  |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the Observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements,  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb<br>Thermometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Va-<br>pour in a Cubic foot<br>of air. | Additional Weight of<br>Vapour required for<br>complete saturation. | Mean degree of Hu-<br>midity, complete satu-<br>ration being unity. |
|----------------|-------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
|                | °                             | °                   | °                   | °                            | Inches.                          | Troy grs.                                             | Troy grs.                                                           |                                                                     |
| Mid-<br>night. | 77.0                          | 3.8                 | 74.3                | 6.5                          | 0.835                            | 8.99                                                  | 2.08                                                                | 0.81                                                                |
| 1              | 76.8                          | 3.9                 | 74.1                | 6.6                          | .830                             | .94                                                   | .10                                                                 | .81                                                                 |
| 2              | 76.9                          | 3.7                 | 74.3                | 6.3                          | .835                             | 9.01                                                  | .00                                                                 | .82                                                                 |
| 3              | 77.1                          | 3.3                 | 74.8                | 5.6                          | .849                             | .15                                                   | 1.79                                                                | .84                                                                 |
| 4              | 77.8                          | 3.1                 | 75.6                | 5.3                          | .871                             | .39                                                   | .71                                                                 | .85                                                                 |
| 5              | 77.4                          | 2.8                 | 75.4                | 4.8                          | .865                             | .34                                                   | .54                                                                 | .86                                                                 |
| 6              | 77.5                          | 2.8                 | 75.5                | 4.8                          | .868                             | .37                                                   | .54                                                                 | .86                                                                 |
| 7              | 78.6                          | 3.2                 | 76.4                | 5.4                          | .893                             | .62                                                   | .78                                                                 | .84                                                                 |
| 8              | 80.1                          | 4.9                 | 76.7                | 8.3                          | .902                             | .64                                                   | 2.89                                                                | .77                                                                 |
| 9              | 80.8                          | 6.5                 | 76.9                | 10.4                         | .908                             | .66                                                   | 3.75                                                                | .72                                                                 |
| 10             | 81.7                          | 8.2                 | 76.8                | 13.1                         | .905                             | .57                                                   | 4.89                                                                | .66                                                                 |
| 11             | 82.0                          | 9.5                 | 76.3                | 15.2                         | .890                             | .40                                                   | 5.75                                                                | .62                                                                 |
|                |                               |                     |                     |                              |                                  |                                                       |                                                                     |                                                                     |
| Noon.          | 81.8                          | 10.4                | 75.6                | 16.6                         | .871                             | .16                                                   | 6.29                                                                | .59                                                                 |
| 1              | 82.0                          | 11.1                | 75.3                | 17.8                         | .862                             | .06                                                   | .80                                                                 | .57                                                                 |
| 2              | 81.4                          | 11.5                | 74.5                | 18.4                         | .840                             | 8.85                                                  | .92                                                                 | .56                                                                 |
| 3              | 81.1                          | 11.6                | 74.1                | 18.6                         | .830                             | .73                                                   | .95                                                                 | .56                                                                 |
| 4              | 80.9                          | 10.7                | 74.5                | 17.1                         | .840                             | .87                                                   | .32                                                                 | .58                                                                 |
| 5              | 80.9                          | 9.3                 | 75.3                | 14.9                         | .862                             | 9.12                                                  | 5.47                                                                | .63                                                                 |
| 6              | 79.6                          | 8.0                 | 74.8                | 12.8                         | .849                             | .02                                                   | 4.50                                                                | .67                                                                 |
| 7              | 78.7                          | 6.6                 | 74.1                | 11.2                         | .830                             | 8.87                                                  | 3.77                                                                | .70                                                                 |
| 8              | 77.9                          | 5.7                 | 73.9                | 9.7                          | .824                             | .83                                                   | .20                                                                 | .73                                                                 |
| 9              | 77.9                          | 4.9                 | 74.5                | 8.3                          | .840                             | 9.03                                                  | 2.72                                                                | .77                                                                 |
| 10             | 78.2                          | 4.3                 | 75.2                | 7.3                          | .860                             | .24                                                   | .40                                                                 | .79                                                                 |
| 11             | 77.7                          | 4.2                 | 74.8                | 7.1                          | .849                             | .13                                                   | .31                                                                 | .80                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January, 1863, the Greenwich New Factors have been used for  
Computing Dew-point.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1863.*

Solar Radiation, Weather, &c.

|   | Max. Solar<br>radiation. | Rain Gauge<br>5 feet above<br>Ground. | Prevailing direction<br>of the Wind. | General Aspect of the Sky.                                                                                                                       |
|---|--------------------------|---------------------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
|   | °                        | Inches.                               |                                      |                                                                                                                                                  |
| 1 | 135.0                    | ...                                   | S. & W.                              | Cloudless.                                                                                                                                       |
| 2 | 123.0                    | ...                                   | S. & S. E.                           | Cloudless till 6 P. M. cloudy afterwards.                                                                                                        |
| 3 | ...                      | ...                                   | <i>Sunday.</i>                       |                                                                                                                                                  |
| 4 | ...                      | 0.32                                  | E. & S. & S. E.                      | Scatd. \i & \i till Noon; cloudy afterwards; also raining at 2 P. M.                                                                             |
| 5 | 130.0                    | ...                                   | N. E. & S. E.                        | Scatd. clouds till 7 P. M. cloudless afterwards; also slightly drizzling between 8 & 9 A. M.                                                     |
| 6 | ...                      | 0.22                                  | E.                                   | Cloudless till 4 A. M. cloudy afterwards; also drizzling at 11 A. M. & Noon & from 3 to 5 P. M.                                                  |
| 7 | 117.0                    | ...                                   | E. & S. E. & S.                      | Scatd. clouds till 6 P. M. cloudless afterwards.                                                                                                 |
| 8 | ...                      | 1.25                                  | S.                                   | Cloudy; and thundering from 10 A. M. to 1 P. M. and at 8 & 9 P. M. also raining between 8 & 9 and 10 & 11 A. M. and drizzling from 9 to 11 P. M. |
| 9 | 130.0                    | ...                                   | S.                                   | Cloudy till 9 A. M. Scatd. \i afterwards.                                                                                                        |
| 0 | ...                      | ...                                   | <i>Sunday.</i>                       |                                                                                                                                                  |
| 1 | 125.8                    | ...                                   | S.                                   | Cloudless till 3 A. M. Scatd. clouds till 2 P. M. cloudless afterwards.                                                                          |
| 2 | 130.0                    | ...                                   | S. & S. E.                           | Cloudless till 3 A. M. Scatd. \i till 5 P. M. cloudy afterwards.                                                                                 |
| 3 | 127.0                    | ...                                   | S. & E.                              | Cloudy till 4 A. M. Scatd. \i & \i till 2 P. M. cloudless till 8 P. M. cloudy afterwards; also drizzling at 4 A. M. 10 & 11 P. M.                |
| 4 | 132.0                    | ...                                   | S. & S. W.                           | Scatd. clouds till 10 A. M. Scatd. \i & \i afterwards.                                                                                           |
| 5 | 131.0                    | ...                                   | S.                                   | Cloudy till 5 A. M. Scatd. \i till 11 A. M. Scatd. \i till 7 P. M. cloudy & lightning afterwards; also slightly drizzling between 9 & 10 P. M.   |
| 6 | 131.0                    | ...                                   | S. & S. E.                           | Cloudless till 7 A. M. Scatd. clouds till 8 P. M. cloudless afterwards; also slightly drizzling between 2 & 3 P. M.                              |
| 7 | ...                      | ...                                   | <i>Sunday.</i>                       |                                                                                                                                                  |
| 8 | 126.4                    | ...                                   | S.                                   | Cloudless till 7 A. M. Scatd. \i till 3 P. M. cloudy afterwards, also slightly drizzling at 9 P. M.                                              |
| 9 | 130.4                    | ...                                   | S. & S. E.                           | Cloudy till 6 A. M. Scatd. \i & \i till 6 P. M. cloudless afterwards.                                                                            |



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1863.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                      |
|-------|-----------------------|---------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 20    | o<br>132.0            | inches.<br>1.55                 | S. E. & S.                        | Cloudless till 8 A. M. Scatd. ∩i & ∩i till 6 P. M. cloudy with thunder and lightning afterwards; also raining at 7 & 8 P. M.    |
| 21    | ...                   | 0.14                            | S. & E.                           | Cloudy; also drizzling at 11 P. M.                                                                                              |
| 22    | 124.0                 | ...                             | S. E. & S. & E.                   | Cloudless till 6 A. M. Scatd. ∩i till 3 P. M. cloudless till 6 P. M. cloudy afterwards; also very slightly drizzling at 8 P. M. |
| 23    | 130.5                 | ...                             | E. & S.                           | Scatd. clouds till 3 P. M. Scatd. ∩i afterwards.                                                                                |
| 24    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                                 |
| 25    | 134.0                 | 0.72                            | S. & Calm.                        | Cloudless till 7 A. M. Scatd. ∩i & ∩i till 5 P. M. cloudy afterwards; also raining between 7 & 8 P. M.                          |
| 26    | 134.0                 | ...                             | S. & S. E. & S. W.                | Cloudy till 5 A. M. Scatd. ∩i till Noon; Scatd. ∩i afterwards.                                                                  |
| 27    | 130.4                 | ...                             | S.                                | Scatd. clouds.                                                                                                                  |
| 28    | 132.0                 | ...                             | S. & E.                           | Scatd. ∩i & ∩i till 6 P. M. cloudless afterwards.                                                                               |
| 29    | 142.0                 | ...                             | E. & S. & S. E.                   | Cloudy till 7 A. M. Scatd. ∩i & ∩i till 4 P. M. cloudy afterwards.                                                              |
| 30    | 135.0                 | ...                             | S. E. & S.                        | Scatd. ∩i till 2 P. M. cloudy afterwards; also slightly drizzling at 3 P. M.                                                    |
| 31    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                                 |

∩i Cirri, ∩i Cirro strati, ∩i Cumuli, ∩i Cumulo strati, ∩i Nimbi,—i Strati  
∩i Cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1863.*

MONTHLY RESULTS.

|                                                               |    |    | Inches |
|---------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month, ..                | .. | .. | 29.625 |
| Max. height of the Barometer occurred at 10 A. M. on the 7th, | .. | .. | 29.798 |
| Min. height of the Barometer occurred at 4 P. M. on the 30th, | .. | .. | 29.373 |
| <i>Extreme range</i> of the Barometer during the month,       | .. | .. | 0.425  |
| Mean of the Daily Max. Pressures, .                           | .. | .. | 29.694 |
| Ditto ditto Min. ditto, ..                                    | .. | .. | 29.546 |
| <i>Mean daily range</i> of the Barometer during the month, .. | .. | .. | 0.148  |

|                                                                 |    |    | o     |
|-----------------------------------------------------------------|----|----|-------|
| Mean Dry Bulb Thermometer for the month, ..                     | .. | .. | 85.8  |
| Max. Temperature occurred at 4 P. M. on the 29th,               | .. | .. | 104.0 |
| Min. Temperature occurred at 5 A. M. on the 7th,                | .. | .. | 74.0  |
| <i>Extreme range</i> of the Temperature during the month,       | .. | .. | 30.0  |
| Mean of the daily Max. Temperature,                             | .. | .. | 94.5  |
| Ditto ditto Min. ditto, ..                                      | .. | .. | 78.8  |
| <i>Mean daily range</i> of the Temperature during the month, .. | .. | .. | 15.7  |
| Mean Wet Bulb Thermometer for the month, ..                     | .. | .. | 79.3  |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..   | .. | .. | 6.5   |
| Computed Mean Dew-point for the month, ..                       | .. | .. | 74.7  |
| Mean Dry Bulb Thermometer above computed Mean Dew-point, ..     | .. | .. | 11.1  |

|                                                |    |    | Inches |
|------------------------------------------------|----|----|--------|
| Mean Elastic force of Vapour for the month, .. | .. | .. | 0.846  |

|                                                                         |    |    | Troy grains |
|-------------------------------------------------------------------------|----|----|-------------|
| Mean Weight of Vapour for the month, ..                                 | .. | .. | 9.03        |
| Additional Weight of Vapour required for complete saturation,           | .. | .. | 3.80        |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.70        |

|                                                       |    |    | Inches     |
|-------------------------------------------------------|----|----|------------|
| Rained 13 days, Max. fall of rain during 24 hours, .. | .. | .. | 1.55       |
| Total amount of rain during the month, ..             | .. | .. | 4.20       |
| Prevailing direction of the Wind, ..                  | .. | .. | S. & S. E. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1863.*

## MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on.<br>N. E. | Rain on. | E. | Rain on.<br>S. E. | Rain on. | S. | Rain on.<br>S. W. | Rain on. | W. | Rain on.<br>N. W. | Rain on.<br>Calm. | Rain on. | Missed. |
|-----------|--------------|-------------------|----------|----|-------------------|----------|----|-------------------|----------|----|-------------------|-------------------|----------|---------|
|           | No. of days. |                   |          |    |                   |          |    |                   |          |    |                   |                   |          |         |
| Midnight. |              |                   |          |    |                   |          |    |                   |          |    |                   |                   |          |         |
| 1         |              |                   |          | 6  | 6                 | 9        |    | 1                 | 1        |    |                   | 1                 | 3        |         |
| 2         |              |                   |          | 5  | 6                 | 10       |    | 1                 | 1        |    |                   | 2                 | 1        |         |
| 3         |              |                   |          | 6  | 6                 | 11       |    | 1                 | 1        |    |                   | 1                 | 1        |         |
| 4         |              |                   |          | 6  | 5                 | 11       |    | 1                 | 1        |    |                   | 2                 |          |         |
| 5         |              |                   |          | 4  | 1 3               | 11       |    | 1                 | 1        |    |                   | 1                 | 5        |         |
| 6         |              |                   |          | 3  | 5                 | 11       |    | 1                 | 3        |    |                   | 1                 | 2        |         |
| 7         |              | 1                 |          | 5  | 5                 | 11       |    |                   | 3        |    |                   |                   | 1        |         |
| 8         |              | 2                 |          | 4  | 3                 | 14       |    | 1                 | 2        |    |                   |                   |          |         |
| 9         |              |                   |          | 5  | 4                 | 14       |    | 3                 |          |    |                   |                   |          |         |
| 10        |              | 1                 | 1        | 3  | 3                 | 14       | 1  | 5                 |          |    |                   |                   |          |         |
| 11        | 1            |                   |          | 3  | 3                 | 15       | 4  | 4                 |          |    |                   |                   |          |         |
|           |              |                   |          | 1  | 4                 | 16       | 1  | 2                 | 2        |    |                   |                   |          |         |
| Noon.     |              |                   |          | 2  | 6                 | 12       |    | 4                 | 2        |    |                   |                   |          |         |
| 1         |              |                   |          | 1  | 5                 | 13       |    | 4                 | 3        |    |                   |                   |          |         |
| 2         |              |                   |          | 1  | 5                 | 11       |    | 6                 | 1        |    | 2                 | 1                 |          |         |
| 3         |              |                   |          | 2  | 1 7               | 11       | 1  | 4                 | 1        |    | 1                 |                   |          |         |
| 4         | 1            | 1                 |          | 2  | 8                 | 9        |    | 3                 |          |    |                   |                   | 2        |         |
| 5         |              | 1                 |          | 1  | 3                 | 20       | 1  | 1                 |          |    |                   |                   |          |         |
| 6         |              | 1                 |          | 3  | 5                 | 16       |    | 1                 |          |    |                   |                   |          |         |
| 7         | 2            | 1                 | 1        | 4  | 4                 | 15       |    |                   |          |    |                   |                   |          |         |
| 8         | 2            | 2                 |          | 4  | 5                 | 11       |    |                   |          | 1  | 1                 | 1                 | 1        |         |
| 9         | 1            | 1                 | 1        | 6  | 3                 | 13       | 2  |                   |          |    |                   | 2                 |          |         |
| 10        | 1            | 1                 |          | 7  | 3                 | 12       | 3  |                   |          |    |                   |                   | 2        |         |
| 11        | 1            | 1                 |          | 7  | 1 3               | 12       | 2  | 1                 |          |    |                   |                   | 1        |         |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.

Height of the Cistern of the Standard Barometer above the Sea-level, 18.11.

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 29.506                                          | 29.561                                    | 29.446  | 0.115   | 89.8                          | 97.4                                          | 82.8 | 14.6  |
| 2     | .541                                            | .601                                      | .459    | .142    | 89.8                          | 98.6                                          | 80.8 | 17.8  |
| 3     | .504                                            | .561                                      | .428    | .133    | 88.1                          | 96.9                                          | 78.8 | 18.1  |
| 4     | .470                                            | .523                                      | .398    | .125    | 89.5                          | 96.7                                          | 84.4 | 12.3  |
| 5     | .501                                            | .537                                      | .451    | .086    | 90.2                          | 97.2                                          | 85.6 | 11.6  |
| 6     | .590                                            | .688                                      | .518    | .170    | 90.3                          | 97.8                                          | 77.0 | 20.8  |
| 7     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 8     | .649                                            | .695                                      | .583    | .112    | 84.6                          | 89.6                                          | 79.6 | 10.0  |
| 9     | .659                                            | .738                                      | .602    | .136    | 83.0                          | 86.8                                          | 78.0 | 8.8   |
| 10    | .629                                            | .705                                      | .559    | .146    | 85.5                          | 90.9                                          | 81.4 | 9.5   |
| 11    | .565                                            | .606                                      | .499    | .107    | 82.2                          | 91.4                                          | 77.8 | 13.6  |
| 12    | .538                                            | .594                                      | .474    | .120    | 80.9                          | 84.9                                          | 77.8 | 7.1   |
| 13    | .549                                            | .596                                      | .504    | .092    | 81.8                          | 86.4                                          | 79.8 | 6.6   |
| 14    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 15    | .567                                            | .627                                      | .525    | .102    | 82.6                          | 87.2                                          | 79.8 | 7.4   |
| 16    | .619                                            | .665                                      | .550    | .115    | 82.5                          | 86.2                                          | 80.4 | 5.8   |
| 17    | .597                                            | .656                                      | .527    | .129    | 84.2                          | 90.4                                          | 80.0 | 10.4  |
| 18    | .508                                            | .553                                      | .435    | .118    | 83.3                          | 88.6                                          | 80.2 | 8.4   |
| 19    | .420                                            | .487                                      | .347    | .140    | 83.5                          | 89.4                                          | 80.5 | 8.9   |
| 20    | .326                                            | .406                                      | .268    | .138    | 82.4                          | 85.8                                          | 80.2 | 5.6   |
| 21    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 22    | .482                                            | .558                                      | .446    | .112    | 81.7                          | 85.4                                          | 78.8 | 6.6   |
| 23    | .536                                            | .579                                      | .482    | .097    | 82.0                          | 85.0                                          | 79.4 | 5.6   |
| 24    | .491                                            | .552                                      | .417    | .135    | 80.1                          | 83.2                                          | 78.0 | 5.2   |
| 25    | .356                                            | .450                                      | .268    | .182    | 83.4                          | 88.8                                          | 79.4 | 9.4   |
| 26    | .264                                            | .315                                      | .199    | .116    | 82.4                          | 86.7                                          | 79.0 | 7.7   |
| 27    | .289                                            | .410                                      | .189    | .221    | 81.6                          | 86.0                                          | 78.4 | 7.6   |
| 28    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 29    | .526                                            | .578                                      | .482    | .096    | 84.7                          | 88.8                                          | 80.6 | 8.2   |
| 30    | .512                                            | .559                                      | .440    | .119    | 85.1                          | 93.0                                          | 78.6 | 14.4  |

• The Mean height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the hourly Observations made during the day. ••

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Date. | Mean Wet Bulb Thermo-<br>meter. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a Cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humidity,<br>complete saturation be-<br>ing unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|
|       | °                               | °                   | °                   | °                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                   |
| 1     | 82.2                            | 7.6                 | 77.6                | 12.2                         | .928                             | 9.83                                             | 4.59                                                                    | .68                                                               |
| 2     | 82.1                            | 7.7                 | 77.5                | 12.3                         | .925                             | .80                                              | .62                                                                     | .68                                                               |
| 3     | 81.3                            | 6.8                 | 77.2                | 10.9                         | .916                             | .73                                              | 3.99                                                                    | .71                                                               |
| 4     | 83.3                            | 6.2                 | 79.6                | 9.9                          | .989                             | 10.48                                            | .81                                                                     | .73                                                               |
| 5     | 83.4                            | 6.8                 | 79.3                | 10.9                         | .979                             | .36                                              | 4.23                                                                    | .71                                                               |
| 6     | 82.5                            | 7.8                 | 77.8                | 12.5                         | .934                             | 9.87                                             | .76                                                                     | .68                                                               |
| 7     | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 8     | 80.1                            | 4.5                 | 76.9                | 7.7                          | .908                             | .70                                              | 2.69                                                                    | .78                                                               |
| 9     | 78.8                            | 4.2                 | 75.9                | 7.1                          | .879                             | .44                                              | .38                                                                     | .80                                                               |
| 10    | 81.2                            | 4.3                 | 78.2                | 7.3                          | .946                             | 10.11                                            | .61                                                                     | .80                                                               |
| 11    | 78.6                            | 3.6                 | 76.1                | 6.1                          | .885                             | 9.51                                             | .03                                                                     | .82                                                               |
| 12    | 78.0                            | 2.9                 | 76.0                | 4.9                          | .882                             | .50                                              | 1.60                                                                    | .86                                                               |
| 13    | 79.1                            | 2.7                 | 77.2                | 4.6                          | .916                             | .85                                              | .55                                                                     | .86                                                               |
| 14    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 15    | 79.2                            | 3.4                 | 76.8                | 5.8                          | .905                             | .71                                              | .97                                                                     | .83                                                               |
| 16    | 79.0                            | 3.5                 | 76.5                | 6.0                          | .896                             | .63                                              | 2.01                                                                    | .83                                                               |
| 17    | 79.6                            | 4.6                 | 76.4                | 7.8                          | .893                             | .56                                              | .68                                                                     | .78                                                               |
| 18    | 79.9                            | 3.4                 | 77.5                | 5.8                          | .925                             | .92                                              | .01                                                                     | .83                                                               |
| 19    | 79.9                            | 3.6                 | 77.4                | 6.1                          | .922                             | .89                                              | .11                                                                     | .82                                                               |
| 20    | 79.1                            | 3.3                 | 76.8                | 5.6                          | .905                             | .71                                              | 1.90                                                                    | .84                                                               |
| 21    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 22    | 78.7                            | 3.0                 | 76.6                | 5.1                          | .899                             | .67                                              | .70                                                                     | .85                                                               |
| 23    | 79.4                            | 2.6                 | 77.6                | 4.4                          | .928                             | .99                                              | .48                                                                     | .87                                                               |
| 24    | 77.6                            | 2.5                 | 75.8                | 4.3                          | .876                             | .46                                              | .38                                                                     | .87                                                               |
| 25    | 79.6                            | 3.8                 | 76.9                | 6.5                          | .908                             | .72                                              | 2.24                                                                    | .81                                                               |
| 26    | 79.6                            | 2.8                 | 77.6                | 4.8                          | .928                             | .97                                              | 1.64                                                                    | .86                                                               |
| 27    | 78.3                            | 3.3                 | 76.0                | 5.6                          | .882                             | .48                                              | .86                                                                     | .84                                                               |
| 28    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 29    | 80.2                            | 4.5                 | 77.0                | 7.7                          | .910                             | .73                                              | 2.69                                                                    | .78                                                               |
| 30    | 80.7                            | 4.4                 | 77.6                | 7.5                          | .928                             | .91                                              | .66                                                                     | .79                                                               |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January, 1863, the Greenwich New Factors have been used  
for computing Dew-point.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer for<br>each hour during the<br>month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture for each hour<br>during the<br>month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|---------------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                                | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                                   | o    | o     |
| Mid-<br>night. | 29.514                                          | 29.659                                                       | 29.272  | 0.387   | 81.7                          | 86.9                                                                | 78.2 | 8.7   |
| 1              | .517                                            | .659                                                         | .238    | .421    | 81.6                          | 86.8                                                                | 78.0 | 8.8   |
| 2              | .506                                            | .652                                                         | .220    | .432    | 81.4                          | 86.8                                                                | 77.8 | 9.0   |
| 3              | .511                                            | .656                                                         | .264    | .392    | 81.0                          | 86.5                                                                | 78.0 | 8.5   |
| 4              | .499                                            | .642                                                         | .189    | .453    | 81.1                          | 86.0                                                                | 78.4 | 7.6   |
| 5              | .498                                            | .650                                                         | .196    | .454    | 81.0                          | 85.8                                                                | 78.4 | 7.4   |
| 6              | .512                                            | .659                                                         | .211    | .448    | 81.3                          | 86.2                                                                | 78.2 | 8.0   |
| 7              | .527                                            | .727                                                         | .210    | .487    | 82.2                          | 87.0                                                                | 78.6 | 8.4   |
| 8              | .540                                            | .738                                                         | .261    | .477    | 84.3                          | 90.0                                                                | 79.2 | 10.8  |
| 9              | .546                                            | .734                                                         | .283    | .451    | 85.8                          | 92.2                                                                | 79.2 | 13.0  |
| 10             | .546                                            | .720                                                         | .291    | .429    | 87.4                          | 94.6                                                                | 78.0 | 16.6  |
| 11             | .537                                            | .712                                                         | .276    | .436    | 88.4                          | 95.8                                                                | 78.0 | 17.8  |
|                |                                                 |                                                              |         |         |                               |                                                                     |      |       |
| Noon.          | .523                                            | .690                                                         | .275    | .415    | 88.2                          | 96.6                                                                | 78.3 | 18.3  |
| 1              | .503                                            | .687                                                         | .255    | .432    | 88.0                          | 97.8                                                                | 79.1 | 18.7  |
| 2              | .484                                            | .655                                                         | .248    | .407    | 87.6                          | 98.6                                                                | 80.9 | 17.7  |
| 3              | .469                                            | .625                                                         | .226    | .399    | 87.6                          | 97.4                                                                | 79.4 | 18.0  |
| 4              | .456                                            | .624                                                         | .213    | .411    | 87.5                          | 97.4                                                                | 78.9 | 18.5  |
| 5              | .456                                            | .621                                                         | .199    | .422    | 86.7                          | 96.3                                                                | 78.8 | 17.5  |
| 6              | .464                                            | .625                                                         | .215    | .410    | 85.7                          | 94.6                                                                | 77.8 | 16.8  |
| 7              | .484                                            | .636                                                         | .246    | .390    | 84.5                          | 90.8                                                                | 78.0 | 12.8  |
| 8              | .508                                            | .650                                                         | .256    | .394    | 83.7                          | 89.0                                                                | 78.0 | 11.0  |
| 9              | .524                                            | .688                                                         | .273    | .415    | 83.0                          | 88.2                                                                | 78.0 | 10.2  |
| 10             | .524                                            | .692                                                         | .295    | .397    | 82.4                          | 87.8                                                                | 78.2 | 9.6   |
| 11             | .531                                            | .691                                                         | .288    | .403    | 81.9                          | 87.4                                                                | 77.0 | 10.4  |

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the Observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Hour.          | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force<br>of Vapour. | Mean Weight of Va-<br>pour in a Cubic<br>foot of air. | Additional Weight of<br>Vapour required<br>for complete satu-<br>ration. | Mean degree of Hu-<br>midity, complete<br>saturation being |
|----------------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------|
|                | o                               | o                   | o                   | o                            | Inches.                          | Troy grs.                                             | Troy grs.                                                                |                                                            |
| Mid-<br>night. | 78.8                            | 2.9                 | 76.8                | 4.9                          | 0.905                            | 9.73                                                  | 1.64                                                                     | 0.86                                                       |
| 1              | 78.8                            | 2.8                 | 76.8                | 4.8                          | .905                             | .73                                                   | .61                                                                      | .86                                                        |
| 2              | 78.7                            | 2.7                 | 76.8                | 4.6                          | .905                             | .73                                                   | .54                                                                      | .86                                                        |
| 3              | 78.5                            | 2.5                 | 76.7                | 4.3                          | .902                             | .72                                                   | .42                                                                      | .87                                                        |
| 4              | 78.6                            | 2.5                 | 76.8                | 4.3                          | .905                             | .75                                                   | .42                                                                      | .87                                                        |
| 5              | 78.6                            | 2.4                 | 76.9                | 4.1                          | .908                             | .78                                                   | .36                                                                      | .88                                                        |
| 6              | 78.8                            | 2.5                 | 77.0                | 4.3                          | .910                             | .81                                                   | .43                                                                      | .87                                                        |
| 7              | 79.4                            | 2.8                 | 77.4                | 4.8                          | .922                             | .91                                                   | .63                                                                      | .86                                                        |
| 8              | 80.5                            | 3.8                 | 77.8                | 6.5                          | .934                             | .99                                                   | 2.29                                                                     | .81                                                        |
| 9              | 81.0                            | 4.8                 | 77.6                | 8.2                          | .928                             | .91                                                   | .92                                                                      | .77                                                        |
| 10             | 81.6                            | 5.8                 | 78.1                | 9.3                          | .943                             | 10.04                                                 | 3.41                                                                     | .75                                                        |
| 11             | 81.5                            | 6.9                 | 77.4                | 11.0                         | .922                             | 9.79                                                  | 4.05                                                                     | .71                                                        |
| Noon.          | 81.3                            | 6.9                 | 77.2                | 11.0                         | .916                             | .73                                                   | .03                                                                      | .71                                                        |
| 1              | 81.3                            | 6.7                 | 77.3                | 10.7                         | .919                             | .76                                                   | 3.92                                                                     | .71                                                        |
| 2              | 81.1                            | 6.5                 | 77.2                | 10.4                         | .916                             | .75                                                   | .77                                                                      | .72                                                        |
| 3              | 81.2                            | 6.4                 | 77.4                | 10.2                         | .922                             | .81                                                   | .71                                                                      | .73                                                        |
| 4              | 81.4                            | 6.1                 | 77.7                | 9.8                          | .931                             | .90                                                   | .59                                                                      | .73                                                        |
| 5              | 80.9                            | 5.8                 | 77.4                | 9.3                          | .922                             | .83                                                   | .35                                                                      | .75                                                        |
| 6              | 80.6                            | 5.1                 | 77.0                | 8.7                          | .910                             | .71                                                   | .09                                                                      | .76                                                        |
| 7              | 80.2                            | 4.3                 | 77.2                | 7.3                          | .916                             | .81                                                   | 2.54                                                                     | .79                                                        |
| 8              | 80.0                            | 3.7                 | 77.4                | 6.3                          | .922                             | .89                                                   | .18                                                                      | .82                                                        |
| 9              | 79.5                            | 3.5                 | 77.0                | 6.0                          | .910                             | .77                                                   | .05                                                                      | .83                                                        |
| 10             | 79.2                            | 3.2                 | 77.0                | 5.4                          | .910                             | .79                                                   | 1.82                                                                     | .84                                                        |
| 11             | 78.7                            | 3.2                 | 76.5                | 5.4                          | .896                             | .65                                                   | .79                                                                      | .85                                                        |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January, 1863, the Greenwich New Factors have been used  
for Computing Dew-point.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                                                  |
|-------|-----------------------|---------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
|       | °                     | Inches.                         |                                   |                                                                                                                                                             |
| 1     | 131.6                 | ...                             | S. & S. E.                        | Cloudy till 10 A. M. Scatd. clouds till 5 P. M. cloudless afterwards.                                                                                       |
| 2     | 131.8                 | ...                             | S.                                | Cloudy till 9 A. M. Scatd. clouds till 7 P. M. cloudy with thunder and lightning afterwards; also slightly drizzling at 11 P. M.                            |
| 3     | 133.0                 | ...                             | S. & E.                           | Cloudy till 6 A. M. Scatd. $\searrow$ & $\swarrow$ afterwards; also slightly drizzling at Midnight.                                                         |
| 4     | 127.4                 | ...                             | S. E. & S.                        | Scatd. $\searrow$ till Noon; cloudless till 4 P. M. Flying clouds afterwards.                                                                               |
| 5     | 129.0                 | ...                             | S. & S. E.                        | Cloudy (high wind throughout.)                                                                                                                              |
| 6     | 124.0                 | ...                             | S. & S. E.                        | Cloudy till 7 A. M. Scatd. clouds till 7 P. M. cloudy afterwards; also raining at 8 & 11 P. M. and lightning at 8 & 9 P. M.                                 |
| 7     | ...                   | 1.03                            | <i>Sunday.</i>                    |                                                                                                                                                             |
| 8     | ...                   | 0.12                            | S. E. & S.                        | Cloudless till 4 A. M. cloudy afterwards; also thundering at Noon & lightning between 8 & 10 P. M. & raining between 10 & 11 A. M. & drizzling at 10 P. M.  |
| 9     | ...                   | ...                             | S. & W. & S. E.                   | Scatd. $\searrow$ till 4 A. M. cloudy till 6 P. M. Scatd. $\searrow$ & $\swarrow$ afterwards also lightning at 11 P. M. & drizzling between 10 & 11 A. M.   |
| 10    | 115.0                 | ...                             | S. & Calm.                        | Cloudy till 7 A. M. Scatd. $\searrow$ & $\swarrow$ till 1 P. M. cloudy afterwards; also thunder & lightning at 1 A. M. & 3 P. M. & drizzling at 7 & 8 P. M. |
| 11    | 120.0                 | 1.17                            | S. W. & S. & S. E.                | Cloudy; also occasionally raining.                                                                                                                          |
| 12    | ...                   | 0.22                            | Variable.                         | Cloudy; also raining at 3 & 4 A. M.                                                                                                                         |
| 13    | ...                   | 0.37                            | S. & S. E.                        | Cloudless till 5 A. M. cloudy afterwards; also drizzling at Noon 1 & 3 P. M.                                                                                |
| 14    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                                                             |
| 15    | ...                   | 0.40                            | S. E. & S.                        | Cloudy; also raining at 2 A. M. Noon & 1 P. M.                                                                                                              |
| 16    | ...                   | 1.28                            | S. E. & E.                        | Cloudy till 7 P. M. cloudless afterwards; also raining at 10 A. M. & between 11 & Noon.                                                                     |
| 17    | 115.2                 | 0.22                            | S. E. & E.                        | Cloudless till 5 A. M. Scatd. $\searrow$ till 9 A. M. Scatd. $\swarrow$ till 8 P. M. cloudless afterwards also raining between 5 & 6 P. M.                  |



**Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.**

**Solar Radiation, W**

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                        |
|-------|-----------------------|---------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 18    | 0<br>...              | Inches<br>0.79                  | S. E. & N. E. & S.                | Cloudless till 5 A. M. cloudy till 6 P. M. Scatd. clouds afterwards ; also raining between Noon & 1 P. M. & thundering at 1 P. M. |
| 19    | 116.2                 | 0.73                            | E. & N. E.                        | Cloudy ; also raining at 4 A. M. 2 & 5 P. M.                                                                                      |
| 20    | ...                   | 0.13                            | E. & N. E.                        | Cloudy ; also occasionally drizzling.                                                                                             |
| 21    | ...                   | 1.07                            | Sunday.                           |                                                                                                                                   |
| 22    | ...                   | 3.19                            | S. W. & S. E.                     | Cloudy ; also raining between 5 & 8 P. M. & lightning & thundering at 6 P. M.                                                     |
| 23    | ...                   | 0.32                            | S. W. & S.                        | Cloudy ; also drizzling at 5 A. M. Noon, & from 7 to 9 P. M. & thundering at 8 P. M.                                              |
| 24    | ...                   | 0.37                            | S. & W.                           | Cloudy ; also drizzling constantly from Midnight to 1 P. M.                                                                       |
| 25    | 120.0                 | ...                             | N. & N. E.                        | Cloudy ; also slightly drizzling between 8 & 9 A. M. & 11 A. M. & Noon.                                                           |
| 26    | ...                   | 0.42                            | N. E. & N.                        | Cloudy ; also drizzling constantly.                                                                                               |
| 27    | ...                   | 0.18                            | S. E. & S. & N. E.                | Cloudy ; also drizzling from 1 to 8 P. M.                                                                                         |
| 28    | ...                   | 0.38                            | Sunday.                           |                                                                                                                                   |
| 29    | 122.7                 | ...                             | S.                                | Scatd. \i & \i ; also drizzling between 11 & Noon.                                                                                |
| 30    | 115.0                 | 0.54                            | S. & N. W.                        | Cloudy till 7 A. M. Scatd. \i till 1 P. M. cloudy afterwards & thundering at 3 P. M. also raining at 6 A. M. 5 & 7 P. M.          |

\i Cirri, \i Cirro strati, \i Cumuli, \i Cumulo strati, \i Nimbi, —i Strati, \i Cirro cumuli.

# Meteorological Observations.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.*

## MONTHLY RESULTS.

|                                                               |    |    | Inches |
|---------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month,                   | .. | .. | 29.507 |
| Max. height of the Barometer occurred at 8 A. M. on the 9th,  | .. | .. | 29.738 |
| Min. height of the Barometer occurred at 4 A. M. on the 27th, | .. | .. | 29.189 |
| Extreme range of the Barometer during the month,              | .. | .. | 0.549  |
| Mean of the daily Max. Pressures,                             | .. | .. | 29.569 |
| Ditto ditto Min. ditto,                                       | .. | .. | 29.442 |
| Mean daily range of the Barometer during the month,           | .. | .. | 0.127  |

|                                                       |    |    | °    |
|-------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,              | .. | .. | 84.4 |
| Max. Temperature occurred at 2 P. M. on the 2nd,      | .. | .. | 98.6 |
| Min. Temperature occurred at 11 P. M. on the 6th,     | .. | .. | 77.0 |
| Extreme range of the Temperature during the month,    | .. | .. | 21.6 |
| Mean of the daily Max. Temperature,                   | .. | .. | 90.0 |
| Ditto ditto Min. ditto,                               | .. | .. | 79.9 |
| Mean daily range of the Temperature during the month, | .. | .. | 10.1 |

|                                                            |    |    | °      |
|------------------------------------------------------------|----|----|--------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 80.0   |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 4.4    |
| Computed Mean Dew-point for the month,                     | .. | .. | 76.9   |
| Mean Dry Bulb Thermometer above computed Mean Dew-point,   | .. | .. | 7.5    |
|                                                            |    |    | Inches |
| Mean Elastic force of Vapour for the month,                | .. | .. | 0.908  |

|                                                                         |    |    | Troy grains |
|-------------------------------------------------------------------------|----|----|-------------|
| Mean Weight of Vapour for the month,                                    | .. | .. | 9.70        |
| Additional Weight of Vapour required for complete saturation,           | .. | .. | 2.61        |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.79        |

|                                                    |    |    | Inches     |
|----------------------------------------------------|----|----|------------|
| Rained 26 days, Max. fall of rain during 24 hours, | .. | .. | 3.19       |
| Total amount of rain during the month,             | .. | .. | 12.93      |
| Prevailing direction of the Wind,                  | .. | .. | S. & S. E. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on. | N. E. | Rain on. | E. | Rain on. | S. E. | Rain on. | S. | Rain on. | S. W. | Rain on. | W. | Rain on. | N. W. | Rain on. | Calm. | Rain on. | Missed. |
|-----------|--------------|----------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|-------|----------|---------|
|           | No. of days. |          |       |          |    |          |       |          |    |          |       |          |    |          |       |          |       |          |         |
| Midnight. | 2            |          |       |          | 1  | 1        | 5     |          | 12 | 1        |       |          | 1  |          | 1     |          |       |          | 3       |
| 1         | 1            |          | 1     |          | 1  |          | 6     |          | 12 | 1        |       |          | 1  |          |       |          | 1     | 4        |         |
| 2         | 1            | 1        | 1     |          | 1  |          | 8     |          | 9  | 2        | 1     |          | 1  |          |       |          | 4     |          |         |
| 3         | 1            | 1        |       | 1        | 1  |          | 9     | 1        | 8  | 1        | 1     |          |    |          |       |          | 3     | 2        |         |
| 4         |              |          | 3     | 1        | 3  | 1        | 7     | 1        | 8  | 1        | 1     |          |    |          | 1     |          | 1     | 1        | 2       |
| 5         | 3            | 1        | 2     |          | 1  |          | 6     |          | 7  | 2        | 1     | 1        |    |          |       |          | 1     |          | 5       |
| 6         | 3            | 3        | 3     |          | 5  |          | 6     |          | 6  | 1        | 2     | 3        | 1  | 1        |       |          |       |          |         |
| 7         | 2            | 2        | 4     |          | 4  |          | 6     |          | 6  |          | 3     | 3        |    |          |       |          |       |          |         |
| 8         | 2            | 1        | 2     |          | 6  |          | 4     |          | 8  | 1        | 3     | 1        | 1  |          |       |          |       |          |         |
| 9         | 1            |          | 3     | 1        | 5  |          | 2     |          | 10 |          | 2     | 2        | 3  | 1        |       |          |       |          |         |
| 10        | 1            | 1        | 3     |          | 6  | 1        | 2     |          | 6  |          | 4     | 4        | 2  | 2        |       |          |       |          |         |
| 11        |              |          | 2     |          | 4  |          | 4     |          | 6  | 1        | 7     |          | 2  | 2        | 1     |          |       |          |         |
| Noon.     |              |          | 2     | 2        | 5  | 1        | 4     |          | 7  | 1        | 3     | 2        | 3  | 1        | 2     | 1        |       |          |         |
| 1         |              |          |       |          | 2  |          | 4     | 3        | 9  | 1        | 4     |          | 1  | 1        | 2     | 1        |       |          |         |
| 2         | 2            |          | 2     | 1        | 4  | 1        | 8     | 1        | 11 | 1        | 2     |          | 1  | 1        |       |          |       |          |         |
| 3         |              |          | 2     | 1        | 4  |          | 4     |          | 9  | 1        | 4     | 1        | 1  | 1        | 2     |          |       |          |         |
| 4         |              |          | 4     | 1        | 2  | 1        | 9     | 1        | 5  |          | 4     | 1        | 1  | 1        |       |          |       |          |         |
| 5         | 1            |          | 3     | 1        | 1  |          | 11    | 2        | 8  | 1        |       |          | 2  | 1        |       |          |       |          |         |
| 6         | 1            | 1        | 1     | 1        | 1  |          | 9     | 1        | 13 | 1        |       |          | 1  | 1        |       |          |       |          |         |
| 7         | 1            | 1        | 1     | 1        | 1  |          | 7     | 1        | 14 | 2        | 2     | 1        |    |          |       |          |       |          |         |
| 8         | 1            | 1        | 1     | 1        | 3  | 1        | 5     | 1        | 13 | 4        | 2     | 1        |    |          |       |          | 1     | 1        |         |
| 9         | 1            |          | 2     |          | 2  | 1        | 4     | 1        | 13 | 1        | 2     |          |    |          |       |          | 2     |          |         |
| 10        | 1            | 1        | 1     |          | 2  |          | 5     |          | 11 |          | 2     |          | 1  |          |       |          | 1     | 1        |         |
| 11        | 1            |          | 1     |          | 4  | 3        | 5     |          | 10 |          | 2     |          | 2  |          |       |          | 1     |          | 2       |

# Meteorological Observations.

xcvii.

*Abstract of the results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1863.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Height of the Cistern of the Standard Barometer above the Sea-level, **48.11** Feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 29.472                                          | 29.533                                    | 29.399  | 0 134   | 82.8                          | 87.0                                          | 80.0 | 7.0   |
| 2     | .434                                            | .475                                      | .364    | .111    | 83.9                          | 88.7                                          | 80.0 | 8.7   |
| 3     | .410                                            | .456                                      | .343    | .113    | 85.0                          | 91.3                                          | 80.4 | 10.9  |
| 4     | .462                                            | .534                                      | .407    | .127    | 82.1                          | 84.1                                          | 80.0 | 4.1   |
| 5     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 6     | .519                                            | .567                                      | .472    | .095    | 83.3                          | 86.9                                          | 81.4 | 5.5   |
| 7     | .565                                            | .643                                      | .511    | .132    | 83.2                          | 88.6                                          | 80.2 | 8.4   |
| 8     | .612                                            | .670                                      | .559    | .111    | 82.9                          | 89.2                                          | 79.5 | 9.7   |
| 9     | .622                                            | .679                                      | .574    | .105    | 83.5                          | 88.8                                          | 79.9 | 8.9   |
| 10    | .645                                            | .688                                      | .600    | .088    | 83.8                          | 88.4                                          | 80.0 | 8.4   |
| 11    | .620                                            | .665                                      | .548    | .117    | 83.9                          | 89.8                                          | 80.4 | 9.4   |
| 12    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 13    | .580                                            | .627                                      | .515    | .112    | 85.1                          | 89.7                                          | 81.2 | 8.5   |
| 14    | .574                                            | .615                                      | .513    | .102    | 84.4                          | 89.5                                          | 80.4 | 9.1   |
| 15    | .535                                            | .592                                      | .474    | .118    | 82.9                          | 89.3                                          | 81.0 | 8.3   |
| 16    | .495                                            | .543                                      | .443    | .100    | 82.7                          | 87.1                                          | 80.4 | 6.7   |
| 17    | .461                                            | .502                                      | .402    | .100    | 82.6                          | 85.7                                          | 79.9 | 5.8   |
| 18    | .396                                            | .464                                      | .312    | .152    | 82.7                          | 88.5                                          | 80.2 | 8.3   |
| 19    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 20    | .528                                            | .589                                      | .484    | .105    | 83.3                          | 87.5                                          | 79.2 | 8.3   |
| 21    | .575                                            | .622                                      | .528    | .094    | 83.3                          | 87.6                                          | 80.2 | 7.4   |
| 22    | .594                                            | .641                                      | .543    | .098    | 84.2                          | 89.7                                          | 80.8 | 8.9   |
| 23    | .569                                            | .617                                      | .496    | .121    | 83.5                          | 89.7                                          | 81.0 | 8.7   |
| 24    | .525                                            | .585                                      | .461    | .124    | 84.7                          | 89.9                                          | 80.9 | 9.0   |
| 25    | .501                                            | .550                                      | .410    | .140    | 85.5                          | 92.4                                          | 81.6 | 10.8  |
| 26    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 27    | .454                                            | .515                                      | .368    | .147    | 82.2                          | 87.2                                          | 79.0 | 8.2   |
| 28    | .463                                            | .512                                      | .415    | .097    | 83.5                          | 88.7                                          | 80.6 | 8.1   |
| 29    | .475                                            | .513                                      | .424    | .089    | 81.7                          | 85.5                                          | 79.0 | 6.5   |
| 30    | .436                                            | .488                                      | .371    | .117    | 82.7                          | 86.8                                          | 78.8 | 8.0   |
| 31    | .505                                            | .564                                      | .456    | .108    | 83.5                          | 87.6                                          | 80.3 | 7.3   |

\* The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the hourly Observations made during the day.

# Meteorological Observation.

## Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1863.

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a Cubic Foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humi-<br>dity, complete satu-<br>ration being unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------|
|       | °                               | °                   | °                   | °                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                     |
| 1     | 79.4                            | 3.4                 | 77.0                | 5.8                          | 0.910                            | 9.77                                             | 1.98                                                                    | .83                                                                 |
| 2     | 80.6                            | 3.3                 | 78.3                | 5.6                          | .949                             | 10.16                                            | .97                                                                     | .84                                                                 |
| 3     | 80.8                            | 4.2                 | 77.9                | 7.1                          | .937                             | .02                                              | 2.51                                                                    | .80                                                                 |
| 4     | 79.8                            | 2.3                 | 78.2                | 3.9                          | .946                             | .17                                              | 1.34                                                                    | .88                                                                 |
| 5     | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 6     | 79.6                            | 3.7                 | 77.0                | 6.3                          | .910                             | 9.77                                             | 2.16                                                                    | .82                                                                 |
| 7     | 79.1                            | 4.1                 | 76.2                | 7.0                          | .887                             | .52                                              | .37                                                                     | .80                                                                 |
| 8     | 78.8                            | 4.1                 | 75.9                | 7.0                          | .879                             | .44                                              | .35                                                                     | .80                                                                 |
| 9     | 79.4                            | 4.1                 | 76.5                | 7.0                          | .896                             | .61                                              | .39                                                                     | .80                                                                 |
| 10    | 79.6                            | 4.2                 | 76.7                | 7.1                          | .902                             | .66                                              | .41                                                                     | .80                                                                 |
| 11    | 79.8                            | 4.1                 | 76.9                | 7.0                          | .908                             | .72                                              | .41                                                                     | .80                                                                 |
| 12    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 13    | 80.8                            | 4.3                 | 77.8                | 7.3                          | .934                             | .99                                              | .58                                                                     | .80                                                                 |
| 14    | 80.3                            | 4.1                 | 77.4                | 7.0                          | .922                             | .87                                              | .44                                                                     | .80                                                                 |
| 15    | 79.8                            | 3.1                 | 77.6                | 5.3                          | .928                             | .97                                              | 1.82                                                                    | .85                                                                 |
| 16    | 79.8                            | 2.9                 | 77.8                | 4.9                          | .934                             | 10.03                                            | .69                                                                     | .86                                                                 |
| 17    | 79.4                            | 3.2                 | 77.2                | 5.4                          | .916                             | 9.85                                             | .83                                                                     | .84                                                                 |
| 18    | 79.7                            | 3.0                 | 77.6                | 5.1                          | .928                             | .97                                              | .75                                                                     | .85                                                                 |
| 19    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
|       | 79.3                            | 4.0                 | 76.5                | 6.8                          | .896                             | .61                                              | 2.32                                                                    | .81                                                                 |
| 21    | 79.9                            | 3.4                 | 77.5                | 5.8                          | .925                             | .92                                              | .01                                                                     | .83                                                                 |
| 22    | 80.2                            | 4.0                 | 77.4                | 6.8                          | .922                             | .87                                              | .37                                                                     | .81                                                                 |
| 23    | 80.0                            | 3.5                 | 77.5                | 6.0                          | .925                             | .92                                              | .08                                                                     | .83                                                                 |
| 24    | 80.8                            | 3.9                 | 78.1                | 6.6                          | .943                             | 10.08                                            | .34                                                                     | .81                                                                 |
| 25    | 80.7                            | 4.8                 | 77.3                | 8.2                          | .919                             | 9.82                                             | .90                                                                     | .77                                                                 |
| 26    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 27    | 79.2                            | 3.0                 | 77.1                | 5.1                          | .913                             | .82                                              | 1.72                                                                    | .85                                                                 |
| 28    | 79.9                            | 3.6                 | 77.4                | 6.1                          | .922                             | .89                                              | 2.11                                                                    | .82                                                                 |
| 29    | 78.9                            | 2.8                 | 76.9                | 4.8                          | .908                             | .76                                              | 1.61                                                                    | .86                                                                 |
| 30    | 79.5                            | 3.2                 | 77.3                | 5.4                          | .919                             | .88                                              | .84                                                                     | .84                                                                 |
| 31    | 79.2                            | 4.3                 | 76.2                | 7.3                          | .887                             | .52                                              | 2.48                                                                    | .79                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January, 1863, the Greenwich New Factors have been used\* for  
computing Dew-points.

*abstract of the results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>for each hour during<br>the month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Temperature<br>for each hour during<br>the month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|----------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                           | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                              | o    | o     |
| Mid-<br>night. | 29.534                                          | 29.665                                                       | 29.422  | 0.243   | 81.6                          | 83.0                                                           | 80.4 | 2.6   |
| 1              | .526                                            | .615                                                         | .398    | .247    | 81.3                          | 82.8                                                           | 80.0 | 2.8   |
| 2              | .519                                            | .636                                                         | .391    | .245    | 81.1                          | 82.7                                                           | 79.8 | 2.9   |
| 3              | .509                                            | .623                                                         | .389    | .234    | 80.9                          | 82.5                                                           | 79.6 | 2.9   |
| 4              | .518                                            | .621                                                         | .385    | .236    | 80.8                          | 82.4                                                           | 79.6 | 2.8   |
| 5              | .509                                            | .631                                                         | .398    | .233    | 80.6                          | 82.3                                                           | 78.8 | 3.5   |
| 6              | .528                                            | .651                                                         | .408    | .243    | 80.6                          | 82.2                                                           | 79.0 | 3.2   |
| 7              | .541                                            | .665                                                         | .423    | .242    | 81.3                          | 83.2                                                           | 79.8 | 3.4   |
| 8              | .550                                            | .668                                                         | .430    | .238    | 82.9                          | 85.4                                                           | 79.0 | 6.4   |
| 9              | .560                                            | .683                                                         | .437    | .246    | 84.0                          | 86.7                                                           | 79.5 | 7.2   |
| 10             | .560                                            | .687                                                         | .429    | .258    | 85.2                          | 88.0                                                           | 80.3 | 7.7   |
| 11             | .554                                            | .688                                                         | .420    | .268    | 86.0                          | 89.0                                                           | 81.4 | 7.6   |
| Noon.          | .538                                            | .679                                                         | .395    | .284    | 87.1                          | 91.1                                                           | 83.0 | 8.1   |
| 1              | .519                                            | .655                                                         | .370    | .285    | 86.6                          | 91.3                                                           | 82.0 | 9.3   |
| 2              | .497                                            | .631                                                         | .349    | .282    | 86.7                          | 91.3                                                           | 82.8 | 8.5   |
| 3              | .480                                            | .616                                                         | .329    | .287    | 86.8                          | 92.4                                                           | 81.0 | 11.4  |
| 4              | .465                                            | .609                                                         | .316    | .393    | 85.8                          | 89.5                                                           | 81.1 | 8.4   |
| 5              | .464                                            | .600                                                         | .312    | .288    | 85.0                          | 87.8                                                           | 81.6 | 6.2   |
| 6              | .470                                            | .609                                                         | .324    | .285    | 84.3                          | 87.4                                                           | 82.2 | 5.2   |
| 7              | .494                                            | .625                                                         | .354    | .271    | 83.4                          | 85.6                                                           | 81.4 | 4.2   |
| 8              | .514                                            | .641                                                         | .381    | .260    | 82.9                          | 85.2                                                           | 81.2 | 4.0   |
| 9              | .533                                            | .660                                                         | .400    | .260    | 82.6                          | 85.0                                                           | 80.4 | 4.6   |
| 10             | .546                                            | .670                                                         | .421    | .249    | 82.2                          | 84.7                                                           | 80.4 | 4.3   |
| 11             | .543                                            | .678                                                         | .422    | .256    | 81.9                          | 84.5                                                           | 80.4 | 4.1   |

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the Observations made at the several hour during the month.

# Meteorological Observations.

## Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July, 1863.

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.      | Mean Wet Bulb Thermometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew Point. | Mean Elastic force of Vapour. | Mean Weight of Vapour in a Cubic foot of air. | Additional Weight of Vapour required for complete saturation. | Mean degree of Humidity, complete saturation being unity. |
|------------|----------------------------|---------------------|---------------------|---------------------------|-------------------------------|-----------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------|
|            | °                          | °                   | °                   | °                         | Inches.                       | Troy grs.                                     | Troy grs.                                                     |                                                           |
| Mid-night. | 79.0                       | 2.6                 | 77.2                | 4.4                       | 0.916                         | 9.87                                          | 1.47                                                          | 0.87                                                      |
| 1          | 79.0                       | 2.3                 | 77.4                | 3.9                       | .922                          | .93                                           | .31                                                           | .88                                                       |
| 2          | 78.9                       | 2.2                 | 77.4                | 3.7                       | .922                          | .93                                           | .24                                                           | .89                                                       |
| 3          | 78.7                       | 2.2                 | 77.2                | 3.7                       | .916                          | .87                                           | .23                                                           | .89                                                       |
| 4          | 78.6                       | 2.2                 | 77.1                | 3.7                       | .913                          | .84                                           | .23                                                           | .89                                                       |
| 5          | 78.4                       | 2.2                 | 76.9                | 3.7                       | .908                          | .78                                           | .23                                                           | .89                                                       |
| 6          | 78.6                       | 2.0                 | 77.2                | 3.4                       | .916                          | .89                                           | .12                                                           | .90                                                       |
| 7          | 78.9                       | 2.4                 | 77.2                | 4.1                       | .916                          | .87                                           | .37                                                           | .88                                                       |
| 8          | 79.5                       | 3.4                 | 77.1                | 5.8                       | .913                          | .80                                           | .99                                                           | .83                                                       |
| 9          | 79.9                       | 4.1                 | 77.0                | 7.0                       | .910                          | .75                                           | 2.42                                                          | .80                                                       |
| 10         | 80.2                       | 5.0                 | 76.7                | 8.5                       | .902                          | .62                                           | .99                                                           | .76                                                       |
| 11         | 80.7                       | 5.3                 | 77.0                | 9.0                       | .910                          | .71                                           | 3.20                                                          | .75                                                       |
| Noon.      | 81.2                       | 5.9                 | 77.7                | 9.4                       | .931                          | .92                                           | .41                                                           | .74                                                       |
| 1          | 81.0                       | 5.6                 | 77.6                | 9.0                       | .928                          | .89                                           | .25                                                           | .75                                                       |
| 2          | 81.0                       | 5.7                 | 77.6                | 9.1                       | .928                          | .89                                           | .29                                                           | .75                                                       |
| 3          | 80.9                       | 5.9                 | 77.4                | 9.4                       | .922                          | .83                                           | .38                                                           | .74                                                       |
| 4          | 80.9                       | 4.9                 | 77.5                | 8.3                       | .925                          | .88                                           | 2.95                                                          | .77                                                       |
| 5          | 80.7                       | 4.3                 | 77.7                | 7.3                       | .931                          | .96                                           | .57                                                           | .80                                                       |
| 6          | 80.3                       | 4.0                 | 77.5                | 6.8                       | .925                          | .90                                           | .38                                                           | .81                                                       |
| 7          | 80.1                       | 3.3                 | 77.8                | 5.6                       | .934                          | 10.01                                         | 1.95                                                          | .84                                                       |
| 8          | 79.8                       | 3.1                 | 77.6                | 5.3                       | .928                          | 9.97                                          | .82                                                           | .85                                                       |
| 9          | 79.5                       | 3.1                 | 77.3                | 5.3                       | .919                          | .88                                           | .80                                                           | .85                                                       |
| 10         | 79.3                       | 2.9                 | 77.3                | 4.9                       | .919                          | .88                                           | .66                                                           | .86                                                       |
| 11         | 79.2                       | 2.7                 | 77.3                | 4.6                       | .919                          | .88                                           | .56                                                           | .86                                                       |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January, 1863, the Greenwich New Factors have been used for  
computing Dew-points.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1863.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar<br>radiatic | Rain Gat<br>5 feet abv<br>Ground. | Prevailing direction<br>of the Wind. | General Aspect of the Sky.                                                                                                              |
|-------|------------------------|-----------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|       | °                      | Inches                            |                                      |                                                                                                                                         |
| 1     | ...                    | 1.44                              | W. & S. & S. W.                      | Cloudy; also raining at Midnight, at 9 & 10 A. M. and at 8 & 9 P. M.                                                                    |
|       | 117.0                  | 0.44                              | S.                                   | Scatd. ∩i till 7 A. M. cloudy afterwards; also raining between 10 & 11 A. M. and 3 & 4 P. M. and at 11 P. M.                            |
|       | 125.0                  | 1.20                              | S. & E.                              | Cloudy till 9 A. M.; Scatd. ∩i and ∩i till 4 P. M. cloudy afterwards; also raining between 3 & 4 P. M. and from 6 to 10 P. M.           |
| 4     | ...                    | 0.10                              | S.                                   | Cloudy; also drizzling from 11 A. M. to 2 P. M.                                                                                         |
| 5     | ...                    | ...                               | Sunday.                              |                                                                                                                                         |
| 6     | ...                    | ...                               | S.                                   | Cloudy till 7 P. M. cloudless afterwards; also slightly drizzling between 1 and 2 P. M.                                                 |
| 7     | ...                    | ...                               | S. & S. E.                           | Cloudy till 1 P. M. Scatd. ∩i and ∩i afterwards; also slightly drizzling at 7 & 9 A. M.                                                 |
| 8     | 116.0                  | 0.18                              | E.                                   | Cloudless till 8 A. M. Scatd. ∩i and ∩i till 8 P. M. cloudless afterwards; also drizzling between 1 & 3 P. M.                           |
| 9     | 113.2                  | 0.14                              | S. E. & S.                           | Scatd. ∩i till Noon, cloudy afterwards; also raining at 1 P. M.                                                                         |
| 10    | ...                    | 0.30                              | S. & E.                              | Cloudless till 5 A. M. Scatd. ∩i & ∩i till 7 P. M., cloudless afterwards; also raining between Noon and 1 P. M. and between 1 & 2 P. M. |
| 11    | 114.0                  | ...                               | S. & S. W.                           | Cloudless till 4 A. M. Scatd. ∩i & ∩i till 7 P. M. cloudless afterwards, also very slightly drizzling between noon and 1 P. M.          |
| 12    | ...                    | ...                               | Sunday.                              |                                                                                                                                         |
| 13    | ...                    | ...                               | S.                                   | Cloudless till 4 A. M. cloudy till 7 P. M. cloudless afterwards.                                                                        |
| 14    | 115.0                  | ...                               | S. & S. W.                           | Cloudless till 4 A. M. cloudy afterwards also drizzling at 4, 6 & 8 P. M.                                                               |
| 15    | 121.0                  | 1.14                              | S. & W.                              | Cloudless till 4 A. M. cloudy afterwards; also raining from 1 to 4 P. M.                                                                |
| 16    | ...                    | 0.50                              | S.                                   | Scatd. ∩i till 4 A. M. cloudy afterwards; also drizzling after intervals.                                                               |
| 17    | ...                    | ...                               | S.                                   | Cloudy till 8 P. M. cloudless afterwards.                                                                                               |
| 18    | ...                    | 0.46                              | S. & S. W.                           | Cloudy; also drizzling after intervals.                                                                                                 |



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1863.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                                 |
|-------|-----------------------|---------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
|       | 0                     | Inches.                         |                                   |                                                                                                                                            |
| 19    | ...                   | 0.30                            | <i>Sunday.</i>                    |                                                                                                                                            |
| 20    | 129.9                 | ...                             | S. & S. E.                        | Cloudy till 5 A. M. Scatd. ☽ & ☾ till 7 P. M., cloudless afterwards; also drizzled at 1 & 11 A. M.                                         |
| 21    | ...                   | 0.31                            | E. & S. E.                        | Cloudless till 4 A. M. Scatd. ☽ afterwards; also raining between 11 and Noon.                                                              |
| 22    | 120.0                 | 0.24                            | E.                                | Scatd. clouds; also raining between 11 and noon, between 4 & 5 P. M. and between 5 & 6 P. M.                                               |
| 23    | 120.0                 | ...                             | S. E. & S. & E.                   | Cloudless till 3 A. M. Scatd. ☾ & ☽ till Noon, cloudy till 6 P. M. cloudless afterwards; also drizzling between 1 & 2 P. M. and at 5 P. M. |
| 24    | ...                   | 0.99                            | S. & S. E.                        | Cloudy till 7 P. M. cloudless afterwards; also raining at 11 A. M. and at 4 & 5 P. M.                                                      |
| 25    | 115.3                 | ...                             | S. E. & S.                        | Cloudless till 5 A. M. Scatd. ☾ & ☽ afterwards.                                                                                            |
| 26    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                                            |
| 27    | ...                   | 1.96                            | E.                                | Cloudy; also incessantly raining from 3 to 10 A. M. and drizzling at 4 & 5 P. M.                                                           |
| 28    | 116.0                 | ...                             | S. & S. E.                        | Scatd. clouds till 4 P. M. cloudy afterwards; also slightly drizzling at 1 P. M.                                                           |
| 29    | ...                   | 1.22                            | S. E. & S.                        | Cloudy; also constantly raining.                                                                                                           |
| 30    | 110.0                 | 0.30                            | E. & S.                           | Cloudy; also constantly drizzling the whole day.                                                                                           |
| 31    | ...                   | ...                             | S. & S. W.                        | Cloudy; also drizzling between 8 & 9 P. M.                                                                                                 |

☽ Cirri, ☾ Cirro strati, ☽ Cumuli, ☾ Cumulo strati, ☾ Nimbī,—i Strati,  
☽ i Cirro cumuli.

## *Meteorological Observations.*

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1863.*

### MONTHLY RESULTS.

|                                                                   | Inches |
|-------------------------------------------------------------------|--------|
| Mean Height of the Barometer for the month, .. ..                 | 29.519 |
| Max. height of the Barometer occurred at 11 A. M. on the 10th, .. | 29.688 |
| Min. height of the Barometer occurred at 5 P. M. on the 18th, ..  | 29.312 |
| Extreme range of the Barometer during the month, .. ..            | 0.376  |
| Mean of the Daily Max. Pressures, .. ..                           | 29.572 |
| Ditto ditto Min. ditto, .. ..                                     | 29.459 |
| Mean daily range of the Barometer during the month, .. ..         | 0.113  |

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|                                                               |      |
|---------------------------------------------------------------|------|
| Mean Dry Bulb Thermometer for the month, .. ..                | 83.4 |
| Max. Temperature occurred at 3 P. M. on the 25th, .. ..       | 92.4 |
| Min. Temperature occurred at 5 A. M. on the 30th, .. ..       | 78.8 |
| Extreme range of the Temperature during the month, .. ..      | 13.6 |
| Mean of the daily Max. Temperature, .. ..                     | 88.3 |
| Ditto ditto Min. ditto, .. ..                                 | 80.2 |
| Mean daily range of the Temperature during the month, .. ..   | 8.1  |
| Mean Wet Bulb Thermometer for the month, .. ..                | 79.8 |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, .. | 3.6  |
| Computed Mean Dew-point for the month, .. ..                  | 77.3 |
| Mean Dry Bulb Thermometer above computed Mean Dew-point, ..   | 6.1  |

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|                                                   | Inches |
|---------------------------------------------------|--------|
| Mean Elastic force of Vapour for the month, .. .. | 0.919  |

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|                                                                         | Troy grains |
|-------------------------------------------------------------------------|-------------|
| Mean Weight of Vapour for the month, .. ..                              | 9.86        |
| Additional Weight of Vapour required for complete saturation, ..        | 2.10        |
| Mean degree of humidity for the month, complete saturation being unity, | 0.82        |

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|                                                          | Inches          |
|----------------------------------------------------------|-----------------|
| Rained 25 days, Max. fall of rain during 24 hours, .. .. | 1.96            |
| Total amount of rain during the month, .. ..             | 11.22           |
| Prevailing direction of the Wind, .. ..                  | S. & S. E. & E. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1863.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on.<br>N. E. | Rain on.<br>E. | Rain on.<br>S. E. | Rain on.<br>S. | Rain on.<br>S. W. | Rain on.<br>W. | Rain on.<br>N. W. | Rain on.<br>Calm. | Rain on. | Missed. |
|-----------|--------------|-------------------|----------------|-------------------|----------------|-------------------|----------------|-------------------|-------------------|----------|---------|
|           | No. of days. |                   |                |                   |                |                   |                |                   |                   |          |         |
| Midnight. |              |                   |                |                   |                |                   |                |                   |                   |          |         |
| 1         |              |                   |                | 4                 | 2              | 1                 | 12             |                   |                   |          | 7       |
| 2         |              |                   |                | 4                 | 1              | 5                 | 1              | 15                |                   | 1        | 1       |
| 3         |              |                   |                | 4                 | 1              | 6                 | 1              | 15                |                   |          | 2       |
| 4         |              |                   |                | 5                 | 1              | 7                 | 1              | 14                |                   |          |         |
| 5         |              |                   |                | 5                 | 1              | 6                 |                | 13                |                   |          | 2       |
| 6         |              |                   |                | 5                 | 1              | 4                 |                | 11                |                   | 1        | 4       |
| 7         |              | 1                 |                | 6                 | 1              | 5                 | 1              | 12                |                   |          |         |
| 8         | 1            | 1                 |                | 6                 | 2              | 4                 | 1              | 1                 |                   |          | 2       |
| 9         |              | 1                 |                | 4                 | 1              | 6                 | 1              | 11                |                   |          |         |
| 10        | 1            | 3                 | 1              | 6                 | 1              | 3                 | 10             | 3                 | 3                 |          |         |
| 11        | 1            | 3                 | 1              | 7                 | 1              | 1                 | 10             | 1                 | 3                 |          |         |
|           |              |                   |                | 7                 | 2              | 5                 | 2              | 8                 | 1                 | 3        |         |
| Noon.     |              |                   |                | 2                 | 7              | 1                 | 7              | 1                 | 8                 | 2        | 3       |
| 1         | 1            | 2                 | 1              | 2                 | 5              | 1                 | 7              | 4                 | 6                 | 1        | 4       |
| 2         | 2            |                   |                | 2                 | 7              | 1                 | 7              | 1                 | 6                 | 3        | 2       |
| 3         | 1            | 1                 | 1              | 1                 | 8              | 1                 | 10             |                   | 6                 | 2        |         |
| 4         |              |                   |                | 3                 | 1              | 4                 | 1              | 12                | 3                 | 8        |         |
| 5         |              |                   |                | 2                 | 2              | 2                 |                | 16                | 1                 | 7        |         |
| 6         |              |                   |                | 3                 | 1              | 3                 |                | 16                | 4                 | 4        |         |
| 7         |              |                   |                | 6                 | 1              | 2                 |                | 15                |                   | 3        | 1       |
| 8         |              |                   |                | 6                 | 1              | 3                 |                | 16                | 3                 | 1        |         |
| 9         |              |                   |                | 6                 | 1              | 3                 |                | 16                | 1                 | 1        |         |
| 10        |              |                   |                | 5                 |                | 3                 |                | 17                | 1                 | 1        |         |
| 11        |              |                   |                | 4                 |                | 4                 |                | 16                | 1                 | 1        |         |





